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Quality Soldiers: Costs of Manning the Active Army

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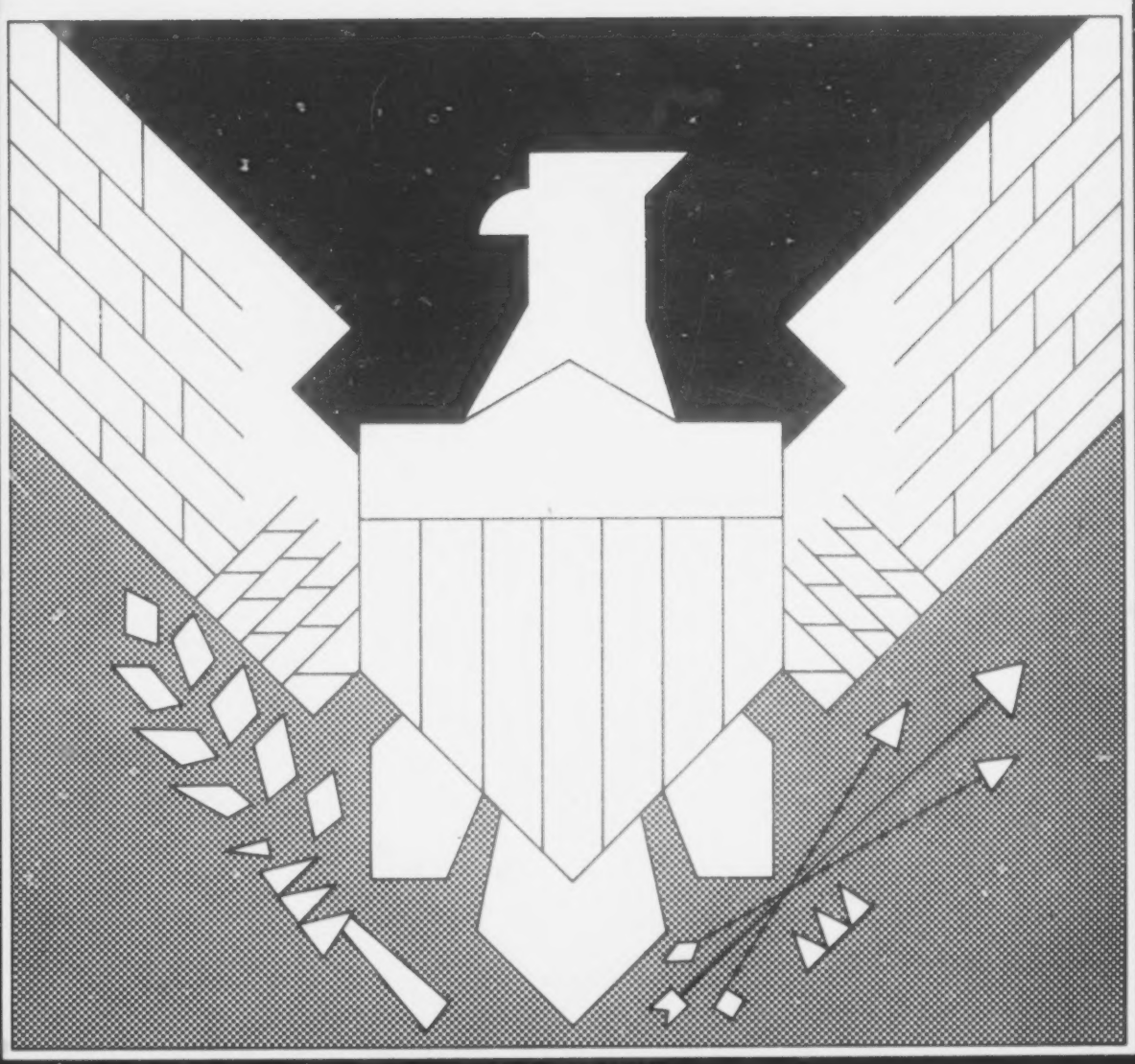

CBO STUDY

QUALITY SOLDIERS:

COSTS OF MANNING

THE ACTIVE ARMY

The Congress of the United States
Congressional Budget Office

PREFACE

The quality of the Army's active-duty enlisted recruits has advanced considerably in recent years. In fiscal year 1985, 90 percent held high school diplomas, up 40 percentage points from the low point of 1980. Scores on aptitude tests have shown comparable improvement. But concern has arisen over the Army's ability to sustain such success--let alone recruit even higher quality in coming years--at an acceptable cost. At the request of the House Armed Services Committee, this report looks at the costs and benefits to the Army of varying levels of recruit quality. In accordance with the Congressional Budget Office's (CBO's) mandate to provide objective analyses, the report makes no recommendations.

Joel Slackman of CBO's National Security Division prepared the report under the general supervision of Robert F. Hale and Neil M. Singer. Robert Mechanic, also of the National Security Division, prepared extensive computer simulations. The author thanks Martin Binkin of the Brookings Institution for his assistance in reviewing an earlier draft. (External reviewers bear no responsibility for the final product, which rests solely with CBO.) Thanks go also to the Defense Department's Office of Accession Policy and its Defense Manpower Data Center, for kindly providing key manpower data. CBO staff members Richard Fernandez, Alex Manganaris, Rosemarie Nielson, and Christian Frederiksen all contributed helpful comments. Francis S. Pierce edited the manuscript, and Rebecca J. Kees prepared it for publication.

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Director

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SUMMARY

Every year the Army recruits about 125,000 young men and women into its active-duty enlisted force. Despite some trends that may make recruiting more difficult--higher rates of employment and declining numbers of military-age youths--the Army should continue to attract well-qualified candidates. Under CBO's baseline projection, well over 80 percent of the Army's male recruits over the next five years will hold high school diplomas.

This means that Army recruits will stay above the educational average for youth in general since only about 77 percent of the eligible population group holds high school diplomas. The percentage of high school graduates among Army recruits will also stay above historical averages. During the years of conscription 1964 through 1972, high school graduates made up only 68 percent of the Army's recruits; and during the 12 years of an all-volunteer force since then, about 71 percent have been graduates.

New recruits in coming years will also perform favorably on the Armed Forces Qualification Test (AFQT), the Defense Department's test of mental aptitude. More than a majority will score above the population's average, placing them in AFQT categories I-IIIA. Only one recruit out of ten will score appreciably below average, in category IV. Of course, such projections rest on numerous assumptions that may not hold true in later years. Even so, prospects for a dramatic downturn in recruitment, on the scale that occurred in 1979 and 1980, seem quite remote.

THE ARMY'S PROGRAM FOR QUALITY

The Army would like to raise its recruiting standards even higher. In a recent report to the Congress, the Army set ambitious objectives under which at least 90 percent of all new recruits would be high school graduates. (Since all female recruits are graduates, about 88.5 percent of male recruits would have diplomas.) No more than 10 percent would score

in the lowest acceptable AFQT category (IV), and between 65 percent and 69 percent would be in the top three categories (I-IIIA). 1/

Higher quality would offer definite advantages. Recruits in the top three AFQT categories, whether high school graduates or dropouts, tend to be more trainable than those in the lower categories. High school graduates are much more likely than dropouts to persevere through their initial term of service. Raising the proportion of graduates would therefore lessen personnel turnover and along with it the costs of travel and training, meaning less spending on ammunition, operation and maintenance, and the salaries of civilian trainers.

The added costs of recruitment would more than offset any such savings, though the net addition to the budget could be modest. CBO estimates that meeting the Army's goals with enlistment bonuses would raise net costs by $410 million to $785 million (in current dollars) over the next five years, depending on the percentage of recruits in AFQT categories I-IIIA (65 percent to 69 percent). This represents less than 1 percent of the full five-year variable costs of manning the Army.

ALTERNATIVES TO THE ARMY'S PROGRAM

In the present climate of budget austerity, any new spending might present difficulties. Moreover, costs might go much higher if the Army had to use comparatively expensive inducements to attract higher-quality recruits, such as education assistance or an across-the-board pay raise. For these reasons, CBO has looked at the trade-off between quality and cost of three alternatives to the Army's program for recruiting:

- Holding the line on spending by keeping recruiting resources constant in real terms over the next five years;
- Reducing recruiting resources for one year by suspending enlistment bonuses and pay raises for recruits in 1987 (similar to past Congressional actions); and

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1. The Defense Department has recently revised the AFQT. In 1985 it adopted the 1980 national population of youths as a new reference standard, replacing the previous one that was based on the World War II mobilization population (under which category IIIA, for example, corresponded to the 50th to 65th percentile score range of officers and enlisted men on active duty as of December 31, 1944). Recent AFQT scores have therefore acquired a different interpretative meaning from scores on earlier tests. This report, to maintain historical continuity, expresses the Army's AFQT objectives under the previous standard. Thus, the Army's stated goal of between 59 percent and 63 percent AFQT I-IIIA recruits appears here as 65 percent to 69 percent.

- Reducing recruiting resources several years in a row by suspending enlistment bonuses in 1987, freezing recruits' pay in 1987, and limiting their pay raises in 1988 and 1989 to 3 percent.

These options would all give up some improvement in recruit quality to achieve budgetary savings. The Summary Table illustrates the scope of the trade-off. Holding the line would mean dropping the percentage of male high school graduates to 81 percent by 1991, roughly eight percentage points below the Army's program. Reducing recruiting resources for only one year would save between $835 million and $1,210 million, relative to the five-year costs of the Army's program. The percentage of high school graduates would fall to about 74 percent. Reducing resources for several years would save more, between $1,215 million and $1,590 million. But the percentage of high school graduates would dip to 68 percent, near the statutory minimum of 65 percent. (All these estimates assume that the proportion of recruits in AFQT category IV would stay at 10 percent.)

To judge these trade-offs, one needs to know about trends in the Army's requirements and, more important, to appreciate the relationship between recruit quality and soldiers' on-the-job performance. To what extent would altering recruit quality change the capability of the Army's enlisted force?

THE ISSUE OF MODERNIZATION

In light of the Army's drive to modernize its weapons, some would argue that recruit quality must go up. New weapons systems like the M-1 tank or the Single Channel Ground and Airborne Radio System are more sophisticated and complex than their predecessors. But despite the array of new equipment, the proportion of enlisted recruits assigned to comparatively technical jobs (such as operating and maintaining advanced electronic equipment) will increase by only about one percentage point between now and 1991. Moreover, new weapons systems do not necessarily make jobs more demanding. Emerging technologies may supplement high-quality personnel by making the new systems easier to maintain and to use. Thus, the key issue remains whether changes in recruit quality would make a significant difference in the Army's capability.

SUMMARY TABLE. EFFECTS OF ALTERNATIVE PROGRAMS FOR ARMY RECRUITING ON COSTS AND PERSONNEL: SUMMARY PROJECTION a/

	Army Program AFQT I-IIIA		Hold-the-Line Program	One-Year Cut in Resources	Three-Year Cut in Resources
	69 Percent	65 Percent			
Five-Year Costs (1987-1991) b/	97,370	96,995	96,585	96,160	95,780
Career Force in 1991					
Number (in thousands)	299.7	299.8	300.0	299.8	299.8
Percent AFQT I-IIIA	53.1	52.7	52.5	52.5	52.5
NPS Accessions in 1991 c/					
Number (in thousands)	127.1	127.0	128.4	130.3	131.9
Percent male HSDG d/	88.5	88.5	81.0	74.0	68.0
Percent AFQT I-IIIA	69.0	65.0	62.1	65.6	65.7
Annual Long-Run Costs e/	23,000	22,885	22,550	22,385	22,205
Long-Run Career Force					
Number (in thousands)	283.5	284.6	281.6	280.0	278.0

(Continued)

SUMMARY TABLE. (Continued)

	Army Program AFQT I-IIIA		Hold-the-Line Program	One-Year Cut in Resources	Three-Year Cut in Resources
	69 Percent	65 Percent			
Percent AFQT I-IIIA	66.6	63.2	61.7	62.1	61.0
Long-Run NPS Accessions c/					
Number (in thousands)	131.9	131.5	135.9	137.7	140.0
Percent male HSDG d/	88.5	88.5	79.0	75.0	69.5
Percent AFQT I-IIIA	69.0	65.0	65.0	65.7	62.9

SOURCE: Congressional Budget Office.

a. All programs assume that the proportion of AFQT IV recruits (all of whom are high school graduates) is held at 10 percent.

b. In millions of current dollars (adjusted for inflation).

c. Signifies recruits who are non-prior-service--without previous military experience. A detailed distribution of accessions appears in Appendix C.

d. High school diploma graduates.

e. In millions of 1987 dollars.

THE RELATIONSHIP OF RECRUIT QUALITY TO INDIVIDUAL PERFORMANCE

Empirical research into individuals' quality and performance offers few conclusive findings. One reason is the difficulty of defining performance in a peacetime military setting, let alone measuring it directly. Researchers have to rely on various proxies to gauge performance: written tests of job knowledge (like the Army's Skill Qualification Tests, known as the SQT), hands-on job proficiency tests, rates of promotion, and supervisors' judgments.

One key finding is that during the first term (years of service one through four), high-aptitude soldiers perform 10 percent to 20 percent better than lower-aptitude soldiers. Those in AFQT categories I-IIIA are more likely to pass the SQT, and score higher on job performance tests. Typically, they receive faster promotions--even though promotion boards do not see their AFQT scores--and they are generally judged more productive by their supervisors.

The relative value of a high school diploma is less certain. Some studies find education unimportant, insofar as having a diploma does not compensate for a relatively low AFQT score. Others suggest that high school graduates are generally more productive than nongraduates. Supervisors, for instance, tend to rate lower-aptitude graduates as superior to higher-aptitude dropouts.

INDIVIDUAL QUALITY AND TEAM PERFORMANCE

Teams, not individuals, accomplish most military missions. In some instances, depending on the nature of a team's mission, one less able member can drag down an entire unit's performance. But groups made up entirely of high-quality members do not always outperform groups made up of soldiers with more modest ability, as shown by Army analysis of tank crews under simulated battle conditions.

Tanks have a driver, a loader, a gunner, and a commander. In the older M-60 tank, crews with gunners and commanders of high aptitude markedly outperform others. In the newer M-1 tank, a high-aptitude gunner can compensate for a commander's low aptitude. Moreover, all crews do

better in the M-1, regardless of their AFQT scores; an M-1 crew whose commander and gunner are both in AFQT category IV will score 5 percent more tank-equivalent kills than even the best M-60 crew.

While higher recruit quality should lead to a more capable first-term force, it could also diminish the career force. At the end of their first term, soldiers in the upper AFQT categories are less likely than others to reenlist. This raises a trade-off between the performance of lower-aptitude but experienced soldiers, and that of less experienced, high-aptitude soldiers. The evidence is sparse, and not consistent. Some researchers find that soldiers' scores on job performance tests converge after several years' experience, suggesting that over time such factors as training on the job, the nature of the assignment, maturity, and marital status, may be more important than measured quality. But other studies of military performance suggest that soldiers with high AFQT scores are able to raise their relative productivities with experience on the job (a finding mirrored in the civilian labor force by the relationship of earnings over time to individual ability).

EFFECTS ON PRODUCTIVITY OF DIFFERENT RECRUITING OBJECTIVES

CBO used the empirical findings on performance to consider the effects that different recruiting objectives might have on the enlisted force's overall "productivity." Productivity--which presumably varies according to soldiers' aptitude, education, and experience--was measured by an index reflecting these characteristics. The index required specifying the relative productivity of different groups. For instance, the average first-term high school graduate in AFQT category IV may be 20 percent less productive than the average nongraduate in AFQT categories I-IIIA. Because of ambiguities in the empirical evidence, the index includes a variety of such assumptions. CBO then projected the long-run composition of the Army's enlisted force under a range of recruiting standards and observed the relationship between the index of productivity and the costs of manning the force.

CBO's analysis suggests that the Army's program might add less to the enlisted force's productivity than to its cost. For example, as the percentage of high school graduates rises from 76 to 90 (while the percentage of AFQT I-IIIA recruits stays at 65), the force's overall productivity increases by about 1.1 percent. But the annual long-run cost of manning the Army increases by about $405 million, or roughly 1.8 percent--driven largely by increases in enlistment bonuses. Similarly, raising the percentage of AFQT I-IIIA recruits from 65 to 69 (with 90 percent of them high school graduates) improves productivity about 0.25 percent, whereas long-run costs increase about 0.50 percent.

This sort of analysis has various limitations. Foremost, a 1 percent improvement in productivity is not necessarily worth a 1 percent increase in costs, depending on its contribution to national defense. In addition, the analysis requires making simplifying assumptions about the relationship between individual soldiers' performance and wider military capability. Measures of overall productivity should therefore be used together with other criteria: the average quality of the population from which the Army draws its recruits, or historical recruiting patterns.

REVIEWING THE ALTERNATIVES: PROS AND CONS

All three of the alternatives CBO looked at would save money at the cost of giving up some potential improvement in the Army's overall capability. They would also lessen the Army's hedge against unexpected future problems, such as a decline in retention that would boost the need for recruits. But the difference in capability between the Army's program and the first alternative (holding the line on costs) or the second alternative (reducing resources for one year) might not be great. Though both alternatives would mean fewer high-quality recruits, the Army still would be comparatively well off. Over the next five years, the percentage of recruits in above-average categories I-IIIA would be in the mid-sixties, and the percentage of high school graduates generally above 80--figures comparing well with historical standards, and with the average quality of the youth population.

The third option, cutting recruits' pay or benefits several years in a row, would have stronger effects. The proportion of male high school graduates would fall to 68 percent (near the statutory minimum) by 1991. Not only would this be below the population average, but it would greatly lessen the Army's hedge against unexpected recruiting problems. Nevertheless, the Army would continue to enjoy better recruiting than in 1980, with close to 20 percentage points more male high school graduates, and 40 percentage points fewer recruits in AFQT category IV.

CHAPTER I

INTRODUCTION AND BACKGROUND

Over the next five years more than half a million young men and women will enter enlisted service in the active Army. The Army would like them to be better educated than in the past, and brighter. Such recruits generally learn faster than others, stay longer, and quite possibly perform better. But they will cost more to attract, particularly as economic and demographic factors shrink the pool from which recruiters can draw. If the economy continues to expand, more youths may favor civilian over military employment. And population trends clearly show that there will be fewer and fewer youths eligible to serve in the Army.

Nevertheless, the Army has endorsed very high standards for recruit quality over the next five years. 1/ Nine recruits out of ten would be high school graduates; at least six out of ten, above average in mental aptitude. Some feel that the Army cannot support such high standards at an acceptable cost. The costs of recruiting, which include television advertising, enlistment bonuses, and education benefits, now run more than $600 million a year and would certainly increase if standards were raised. How much more can the Army spend in a period when all defense costs may have to be cut? And how much recruit quality does the Army need?

Manpower quality is as much an issue for the other services as it is for the Army. The Navy, Air Force, and Marine Corps will also have to grapple in future years with unfavorable economic and demographic trends. But the Army faces the most serious challenge because its needs are greatest. It takes about four out of every ten new recruits entering active-duty service. Moreover, Army recruiting must make up for a particularly dismal past: no other service suffered as great a decline in recruit quality in 1979 and 1980.

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1. Office of the Assistant Secretary of Defense (Manpower, Installations, and Logistics), Report to the House and Senate Committees on Armed Services, *Defense Manpower Quality*, vol. 2, Army Submission (May 1985).

Hence, this report's focus on the Army, specifically on recruitment of enlisted personnel. 2/

THE RECRUITING SYSTEM

Today's active Army numbers 781,000 personnel, of whom about 667,000 are enlisted soldiers. Almost all enter service without having had previous military experience. In 1985, about 103,700 men and 15,400 women entered as new recruits (so-called non-prior-service accessions); another 6,000 had previous military experience (prior-service accessions). They signed up through the U.S. Army recruiting command, which staffs 2,000 recruiting stations throughout the country. Payroll and overhead costs to operate this network of stations amount to over $400 million a year. The Army also spends about $95 million on advertising and more than $150 million on special monetary incentives for selected high school graduates--enlistment bonuses (up to a maximum of $8,000), and supplemental education benefits (up to a maximum of $14,400).

New recruits spend their first few months in training, where they learn first the attitudes, habits, and basic skills of military life (basic training), and then a specific skill (skill training). 3/ About 12 percent wash out of training for medical reasons, lack of motivation, disciplinary problems, and so on. Analysts refer to these losses, before the completion of the first term of service, as attrition. Those who complete training report to duty assignments, often overseas, where they serve out their two, three, or four years of enlistment. At that point, they may reenlist for another term of service, eventually to become "career" personnel--the trained and experienced part of the Army.

WHAT IS QUALITY?

In the context of recruiting statistics, "quality" has precise and narrow meanings: achievement on an aptitude test and achievement in education.

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2. Though quality is also an issue for the Army's officer component, the recruitment of officers poses relatively few problems. For one thing, the Army needs only about 10,000 new active officers a year; it needs about 125,000 enlisted recruits. Moreover, most officers enter service through the Reserve Officer Training Corps program, located in over 300 colleges across the country. The Army's 12,000 ROTC scholarships (as authorized by the Congress) should continue attracting high-quality college students over the next few years.

3. For certain skills, the Army combines basic and skill training into a single course, One-Station Unit Training.

High school diploma graduates who score above average on the military entrance examination have come to be called "high-quality." Because they have more alternative opportunities than those less educated or less able, high-quality youths (particularly males) are in scarce supply to the military.

In practice, quality encompasses a wide range of attributes that contribute to a productive, capable, and well-motivated force. These include cognitive ability, ingenuity, tenacity, flexibility, sacrifice, and loyalty. 4/ Test scores and education alone cannot be expected to measure all of these attributes. But the military needs quantifiable measures for screening applicants, so over the years it has come to rely on test scores and education.

Test Scores

All potential recruits take an entrance examination called the Armed Services Vocational Aptitude Battery (ASVAB). It was developed to predict trainability, not performance on the job. The battery consists of 10 subtests that purport to gauge different aspects of an applicant's ability. The Department of Defense combines scores on four of the subtests (work knowledge, paragraph comprehension, arithmetic reasoning, and numerical operations) to form the Armed Forces Qualification Test, known as the AFQT.

Test scores on the AFQT are grouped in several broad categories that relate to potential for successful training. Applicants scoring average or above, who are easiest to train, fall in categories I, II, and IIIA; those scoring below average fall in categories IIIB, IV, and V. By law, the active military services cannot accept applicants who score in category V. 5/ By regulation, the services will not take category IV applicants who lack high school diplomas. Each service is also limited as to the proportion of all recruits in category IV, for which the Congress has legislated a 20 percent maximum. 6/

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4. Richard Cooper, *Military Manpower and the All-Volunteer Force* (Santa Monica, Calif.: The Rand Corporation, 1977), p. 129; and Paul Nelson, "Personnel Performance Prediction," in Roger Little, ed., *Handbook of Military Institutions* (Beverly Hills, Calif.: Sage Publications, 1971).

5. In 1980, 5 percent of a broad random sample of male youths scored in category I; 35 percent in II; 14 percent in IIIA; 15 percent in IIIB; 23 percent in IV; and 8 percent in category V.

6. In the fiscal year 1981 Authorization Act.

Changes in the population that is used to define the AFQT categories may confuse the debate over recruiting. Each AFQT category corresponds to the range of percentile scores shown in Table 1. Until 1984, these percentile scores were linked to the World War II reference population, so that percentile scores from recent versions of the AFQT had roughly the same interpretative meaning as scores from earlier versions, back to 1950. Whether a recruit enlisted in 1974 or 1984, a percentile score of 93 to 100 (AFQT category I) meant placement in the top 8 percent of those mobilized during the 1940s.

This link was severed in 1985 when the Defense Department changed the reference population to a broad sample of youths tested in 1980. As a result, the proportions of recruits in the various AFQT categories changed. Some who would have been classified in category IIIA under the old reference population now fell into category IIIB. When recruits' scores in

TABLE 1. ARMED FORCES QUALIFICATION TEST CATEGORIES

AFQT Category	Percentile Scores	World War II Reference Population Percent Distribution
I	93-100	8
II	65-92	28
IIIA	50-64	17
IIIB	31-49	17
IV	10-30	21
V[a]	1-9	9

SOURCE: Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs, and Logistics, *Profile of American Youth: 1980 Nationwide Administration of the Armed Services Vocational Aptitude Battery* (March 1982).

a. Those scoring in category V are not allowed to enlist.

1984 are interpreted against the old reference population, 63 percent place in AFQT categories I-IIIA; when their scores are interpreted against the new reference, only 54 percent place in the top three categories.

Comparing new and old AFQT percentages raises methodological problems. One may take 1984 statistics as an example. The change in reference population reduced the proportion of AFQT I-IIIA recruits by 14 percent, from 63 to 54 percent. But if those recruits in 1984 who fell just short of the new category IIIA could have taken the test again, many would have boosted themselves into that category. According to one rule of thumb (used in the past by the Defense Department) one-third of them would have done so. Thus, the new reference population would have reduced the AFQT I-IIIA proportion in 1984 from 63 percent to 57 percent, not 54 percent.

In its report to the Congress on manpower quality, the Army expressed its goals for AFQT percentages according to the new reference population. This study expresses recruiting statistics under the older reference population to facilitate historical comparisons, using the aforementioned one-third rule of thumb to reformulate the Army's goals. 7/

Education

The second common measure of recruit quality is education. High school diploma graduates have markedly lower attrition than nongraduates. 8/ About 75 percent of Army high school graduates complete their first term of enlistment; about 50 percent of nongraduates complete theirs. 9/ In

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7. This method necessarily introduces some imprecision into the AFQT percentages. But even the AFQT statistics that have been formulated under the new reference population entail some uncertainty. Periodically, the Defense Department introduces new forms of the ASVAB for testing recruits. If scores on a newer test are to be interpreted in terms of the norms on previous tests, the Defense Department must convert the newer test's scale to that of some older one. This process, known as calibration, is like any human endeavour not error-proof. If mistakes are found, and later corrected, the proportions of recruits in the various AFQT categories may again change. Hence, the reader should be cautioned against attributing too great a degree of precision to any single AFQT statistic, whether based on the old or on the new reference population.

8. See Richard Buddin, *Analysis of Early Attrition Behavior* (Santa Monica, Calif.: The Rand Corporation, July 1984).

9. Statement of Assistant Secretary of Defense for Manpower, Installations, and Logistics before the Subcommittee on Manpower and Personnel, Senate Armed Services Committee, March 11, 1985.

1981, the Congress legislated that no more than 35 percent of all Army male recruits without previous military service may be without high school diplomas.

Though AQFT scores are not significantly related to attrition, they show some relationship to the willingness of high school graduates to reenlist. High-scoring graduates are less likely to stay past their first terms of service, perhaps because their civilian opportunities are brighter. Among graduates whose three- or four-year terms ended during 1985, those in AFQT categories I-IIIA were about 12 percent less likely than others to reenlist.

CHAPTER II

PROSPECTS FOR RECRUITING

Army recruitment has taken an erratic course since the inauguration of the All-Volunteer Force (AVF) in 1974. While recruiters have generally met their numerical goals, quality has fluctuated. The caliber of recruits turned sharply down in 1977, bottomed out in 1980, turned up in 1981, and has steadily improved since then. Indeed, prospects remain comparatively bright for the next few years. This chapter details past trends in recruiting, and projects Army quality for the next few years.

PAST TRENDS IN RECRUIT QUALITY

Trends in quality--defined as test scores and education--are the best measure of recruiting success, since recruiters almost always meet goals for quantity. 1/ Throughout the years of conscription from 1964 to 1972, high school graduates averaged 68 percent of the Army's recruits. Those in the lowest acceptable AFQT category (IV) averaged about 24 percent. With the advent of the All-Volunteer Force, quality took two contradictory turns. In 1973 to 1976, the proportion of recruits in the bottom AFQT category declined to an average of 15 percent. But the proportion of male recruits holding high school diplomas fell to an average of about 54 percent. In part, the Army was showing a preference for high-scoring dropouts over lower-aptitude high school graduates. 2/

Quality during the AVF's early years would have looked much worse had the Army's demand for recruits not declined. Between 1973 and 1976, for instance, yearly enlistments of AFQT I-IIIA graduates dropped by 19,000, from 80,000 to 61,000. But overall enlistments of recruits without previous military service declined by about 24,000. The downward trend continued throughout succeeding years of the AVF, helping to increase high school graduate percentages.

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1. The one major exception was fiscal year 1979, when Army recruiters fell 11 percent short of their overall quota.

2. An observation made several years ago by Richard Cooper, *op. cit.*, pp. 134-135.

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In 1977, quality started on a steep slide down. Causes included an upturn in the civilian job market, a cap on increases in military pay, and the end of the Vietnam-era GI Bill. Between 1976 and 1980, high-quality male enlistments fell by over 50 percent.

To alleviate the drop in high-quality males, the Army placed greater emphasis on AFQT IIIB high school graduates--and to some extent on AFQT IIIB nongraduates. Thus, the percentage of male high school graduates rose while the proportion of recruits in the top half on test scores (categories I-IIIA) went down. What the Army did not know at the time, though, was that many of those category IIIB recruits actually belonged in category IV. An error on the AFQT that went unrecognized until 1979 had inflated their scores. Upon recomputation, the Defense Department discovered that category IV recruits were far more numerous than had previously been thought: the proportion of Army recruits in the bottommost category in 1980 shifted from 11 percent to 52 percent. (The proportion of male high school graduates was only 49 percent.) Thus, fiscal year 1980 marked a low point for Army recruiting.

In 1981, thanks to Congressionally mandated increases in pay and benefits, a turndown in the economy, and improved recruiter productivity, quality rebounded. Between 1980 and 1984, the Army's enlistments of high-quality males increased by more than 150 percent. By 1985, about 89 percent of all male Army recruits held high school diplomas, and fewer than 10 percent placed in category IV.

The problems of the late seventies linger in the career force, causing what the Army sees as a long-run problem: a bulge of category IV personnel. (The career force is made up of personnel who have served on active duty for more than four years.) About 38 percent of the soldiers with five to nine years of service are in the lowest AFQT category. In contrast, category IVs make up only 19 percent of personnel with 10 or more years of service.

PROSPECTS FOR MANPOWER QUALITY: THE CBO BASELINE

For the next five years, the quality of Army recruits should stay historically high (see Table 2). CBO projects that the proportion of male recruits holding high school diplomas will stay above 81 percent through 1991. Though projections that extend beyond 1988 are somewhat speculative, one thing seems certain: the Army should be able to keep well above the statutory minimum of 65 percent male high school diploma graduates.

TABLE 2. CBO'S BASELINE PROJECTIONS OF ARMY RECRUITMENT AND RETENTION, BY FISCAL YEAR

Personnel Measure	1986	1987	1988	1989	1990	1991
Enlisted Career Force (In thousands) a/	302	305	305	302	301	300
Demand for New Recruits (In thousands) b/	126	124	125	126	127	128
Supply of High-Quality Male Recruits (In thousands) c/	53	50	52	50	49	47
Percentage of Male Accessions with High School Diplomas d/	89	91	89	84	83	81

SOURCE: Congressional Budget Office.

a. Based on retention rates from 1982 and 1984, adjusted for later changes in both military pay and civilian unemployment.

b. Represents non-prior-service recruits who have no previous active-duty military service. CBO assumed that prior-service recruits would number 11,000 a year.

c. Projected contracts (net of attrition) of non-prior-service high school diploma graduates in AFQT categories I-IIIA.

d. Assumes 10 percent of accessions are high school graduates in AFQT category IV.

These baseline projections constitute a benchmark against which to analyze changes in compensation or recruitment policies. They show what is likely to happen if present policies continue through 1991. The projections assume that military pay keeps pace with increases in private-sector wages; that the civilian unemployment rate steadily declines to 6.0 percent; and that the Army limits the percentage of recruits in AFQT category IV to 10 percent of accessions, as it has done recently.

Supply Trends

Prospects for recruiting depend in large part on the willingness of youths to enlist--the "supply" of recruits. CBO projects that between 1985 and 1991 the supply of high-quality male recruits (high school graduates in AFQT categories I-IIIA) will decline roughly 18 percent. About three-quarters of the projected decline results from the assumed drop in civilian unemployment; the rest, from the expected 12 percent decrease in the population pool of young men 18 to 23. Under these projections, the Army should be able to draw about 47,000 high-quality male accessions in 1991--about 7,000 less than in 1985, but still 4,000 more than the number who enlisted in 1982.

That the demographic reality of a smaller youth population will have little effect on recruiting may come as a surprise. Yet a variety of econometric studies have found that the supply of high-quality recruits does not decrease one-to-one with a decline in population. Accordingly, CBO assumes that the 12 percent decrease in the size of the population pool will cut the supply of high-quality recruits only about 4 percent. 3/

The Demand for Recruits

Prospects for recruiting depend not only on the supply of high-quality male recruits but also on the number of career personnel. A favorable trend in the retention of career soldiers can offset a downward trend in supply because it will drive down the demand for recruits. The larger the career force, the smaller the need for enlistees without previous military service. For example, when the career force numbered about 220,000 in 1974, the Army needed about 180,000 recruits; by 1984, when the career force had grown to 305,000, the Army needed only 132,000 new recruits.

To the pleasant surprise of Army managers, reenlistments in 1985 were much higher than anticipated, exceeding objectives by 11 percent during the first eight months of the calendar year. The 4 percent drop in the rate of civilian unemployment over the previous year should actually have encouraged more soldiers to leave, as should the limited pay raise. For

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3. One possible reason for the small population effect is that recruiters' effectiveness may remain steady. The supply of high-quality recruits depends in large part on recruiters' success in contacting eligible youths. At present, recruiters do not reach everyone, having not yet "saturated" the market. As the population of youths falls, the ratio of recruiters to youths will rise, thus helping recruiters contact as many people as before.

these reasons, last year's improved retention poses something of a puzzle. 4/

To hedge against uncertainty, CBO rests its baseline on the somewhat lower retention experience of 1982 and 1984. During 1982, a first-term soldier's willingness to reenlist was relatively unconstrained by managerial policies. The baseline extrapolates first-term retention (years of service 3, 4, and 5) from 1982 reenlistment rates that have been adjusted for later changes in relative military pay and in civilian unemployment. For retention at other points, the baseline extrapolates from the 1984 rate of reenlistment. 5/

Future Uncertainties

The future may of course diverge from CBO's baseline. For example, if a recession were to begin sometime in the late 1980s, the civilian unemployment rate could be as high as 8.7 percent by 1991, rather than the 6.0 percent rate assumed above. High-quality recruits would be in abundant supply at that rate. The opposite might happen if a so-called "cohort effect" materialized. So long as older and younger workers are not perfect substitutes for one another in the labor market, the decreasing size of future youth cohorts could force up the earnings of young workers. 6/ If so, military starting pay would lag increasingly behind youths' civilian wages.

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4. Some of the improvement in retention may stem from changes in reenlistment policy. During fiscal years 1983 and 1984, the Army set relatively demanding standards for reenlistment to weed out marginal performers (mostly those low-quality soldiers who had enlisted in 1979 and 1980 when the AFQT was misnormed). Soldiers in their first or second terms had to be in line for promotion to pay grade E-5 to reenlist. In 1985, the Army relaxed these regulations for those in their first term, so that all first-term soldiers in pay grade E-4 can reenlist.

5. Fiscal year 1985 also brought an overall decline in the rate of attrition, thanks in part to a new Army policy discouraging early discharges. CBO's baseline projects a continuation of this recent attrition improvement.

6. Hong Tan and Michael Ward, in *Forecasting The Wages of Young Men: The Effects of Cohort Size* (Santa Monica, Calif.: The Rand Corporation, May 1985), estimate that by 1990 real wages of high school graduates will have risen about five percentage points in comparison with those of mature workers. Some economists, however, point to several influences that might work the other way: increasing numbers of working women, increasing immigration, and declines in college enrollment. See U.S. Air Force, *An Analysis of The Effects of Varying Male and Female Force Levels, Annex Three: The Prospects of Military Enlistments* (March 1985).

LONG-TERM TRENDS

Though five-year projections figure heavily in government forecasts, military managers must plan for the longer run. Under the Army's "bottom-fed" system of managing personnel, today's recruits will shape the composition of tomorrow's career force, and hence the long-run costs of maintaining a career force. To simulate the long run, CBO extended its baseline projections to cover 30 years. Various aspects of military manpower converge to the following limiting values: the Army has 281,600 career soldiers, and demands 136,000 new recruits a year.

In certain respects the long-run outlook compares unfavorably with the five-year outlook. Over the years after 1991, the career force loses about 18,000 members, thus increasing the Army's yearly need for recruits. Hence, the proportion of male high school graduates drops to about 79 percent. In other respects, the long-run outlook compares favorably. Though smaller, the career force is of higher quality. Today's bulge of category IV soldiers is gone, and the overall proportion of career personnel in category IV falls to about 11 percent while the proportion in the top three categories, I-IIIA, rises to 62 percent.

CONCLUSION

Recruiting successes are likely to continue for at least the next two years. The proportion of male recruits holding high school diplomas, now almost 89 percent, will stay at least in the mid-to-high eighties. A downturn in recruit quality is likely to begin toward the end of the decade, though the percentage of high school graduates will still be high by historical standards. Under baseline assumptions, CBO projects that the male high school graduate percentage will be 81 percent by 1991.

The problem for recruiting is that the Army's ambitious new goals for quality may be too costly. If present policies yield the relatively high levels of quality projected by CBO for the next few years, the Army would still need additional resources to support its program. Those costs are the subject of Chapter III.

CHAPTER III

THE COSTS OF HIGH QUALITY: THE ARMY'S PROGRAM

Meeting the Army's goals for quality would affect costs in a variety of ways. Starting pay would of course have to increase, through higher wages, bonuses, or education benefits, to attract more high-quality youths. Many other expenses--including those for career pay and benefits, for training, and for travel--would also change, some up, some down. For instance, the lower attrition of high-quality recruits should save on training expenses, thus offsetting other increases. This chapter presents CBO's estimates of the costs of manning the force under the Army's program.

THE ARMY'S PROGRAM

The Army's goals for quality emphasize recruiting substantial percentages of high school graduates and of youths with high mental aptitude:

- At least 90 percent of recruits should hold high school diplomas;
- No more than 10 percent should be in the lowest acceptable AFQT category IV, made up of those who score in the 10th to 30th percentile score range; and
- From 65 percent to 69 percent of recruits should be in the top three AFQT categories I-IIIA, which include the 50th to 99th percentile score range.

The objective for the top AFQT categories (a range of 65 percent to 69 percent) resulted from analytic adjustments to recommendations by the

Army's training schools. Last year, the Army's Deputy Chief of Staff for Personnel (DCSPER) asked the Army's training schools to identify their requirements for soldiers in various AFQT categories. The Infantry School at Fort Benning, for example, recommended that 68 percent of its recruits place in AFQT categories I-IIIA. Some schools aimed higher, others lower, but on average they recommended that 65 percent of recruits place in these top three categories. Cost was not a consideration in the schools' recommendations.

DCSPER later appraised the cost-effectiveness of the 65 percent objective, found it "economically conservative," and so proposed raising it by four percentage points. For that reason, this report distinguishes two versions of the Army's program--one calling for 65 percent of recruits in AFQT categories I-IIIA, the other for 69 percent. Both versions aim to have 90 percent high school graduates, and no more than 10 percent of all recruits in the AFQT category IV. 1/

FIVE-YEAR COSTS OF MANNING THE ACTIVE ARMY

CBO projects the variable costs of manning the Army's active-duty enlisted force over the next five years at about $96.6 billion in current dollars (see Table 3). Supporting the higher version of the Army's recruiting program (69 percent in AFQT categories I-IIIA) would add about $785 million to the baseline costs over the next five years. The less ambitious version of the Army's program would increase five-year spending by about $410 million. In either case, most of the increase would fund additional recruiting resources, which this report assumes would take the form of higher enlistment bonuses. Such targeted benefits represent an efficient means of attracting large numbers of high-quality recruits. (See the box for a discussion of key technical details influencing CBO's bonus calculations.) Relative to CBO's baseline, the Army's program would modestly reduce the overall demand for recruits through 1991, and so slightly reduce the "turnover" costs associated with moving and training personnel.

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1. The Army actually expressed its AFQT goals under the new population reference. According to this, the training schools' recommendation was 59 percent in AFQT categories I-IIIA; DCSPER's recommendation was 63 percent. For details, see Office of the Assistant Secretary of Defense for Manpower, Installations, and Logistics, Report to the House and Senate Committees on Armed Services, *Defense Manpower Quality*, vol. 2, Army Submission (May 1985).

ESTIMATING ENLISTMENT BONUSES

Studies of recruiting typically treat cash enlistment bonuses as increments to pay [see, for example, Armor and others, *Recruiting Aptitudes and Job Performance* (Santa Monica, Calif.: The Rand Corporation, September 1982)]. If econometric analyses show that a 10 percent change in earnings would attract enough additional high-quality recruits, then the appropriate enlistment bonus becomes that 10 percent. The larger the earnings base, the larger the bonus necessary to attract any number of high-quality recruits.

A problem arises in defining the earnings base. Is it basic pay only, or regular military compensation (RMC) which includes basic pay, food and housing allowances, and the concomitant tax advantage? Or is it some measure of perceived pay, since enlistees often underestimate their actual wages [Armor, *op. cit.*]? Should the base encompass the first year of earnings, or earnings discounted over a full three- or four-year term?

CBO followed a middle route, defining earnings as the present discounted value of basic pay over the first three years of service (about $22,000), assuming a personal discount rate of 15 percent. Alternative assumptions that CBO tested were, at the low end, the present discounted value of RMC over one year (making the earnings base about $12,000); and at the high end, the discounted value of RMC over three years (about $35,000).

A five-year increase of $785 million would add just under 1 percent to the variable costs of manning the Army, and substantially less to the total defense budget. Viewed another way, however, the necessary changes could mean a substantial increase in the Army's present enlistment bonus program--which may be difficult to achieve in today's austere budgetary climate. Moreover, the costs could be much higher if retention or recruitment proved weaker than expected.

HIGHER-COST ALTERNATIVES TO BONUSES

Though enlistment bonuses are an efficient recruiting tool, they lack political popularity. Some people look askance on giving teenagers large

TABLE 3. PROJECTED VARIABLE COSTS OF MANNING THE ACTIVE ARMY UNDER THE PRESENT RECRUITING PROGRAM AND UNDER THE ARMY'S TWO ALTERNATIVE PROGRAMS, FISCAL YEARS 1987-1991 (In millions of current dollars) a/

Type of Cost	1987	1988	1989	1990	1991	Five-Year Total
			Baseline			
Recruiting b/	240	245	240	240	240	1,205
Turnover c/	625	660	685	715	750	3,435
Pay and Benefits d/	12,840	13,610	14,395	15,255	16,185	72,285
Retirement Accrual e/	3,395	3,605	3,825	4,060	4,320	19,205
Enlistment Bonuses	55	80	105	105	110	455
Total	17,155	18,200	19,250	20,375	21,605	96,585
			Army Program (65 percent)			
Recruiting b/	245	255	265	270	275	1,310
Turnover c/	625	660	685	710	745	3,425
Pay and Benefits d/	12,840	13,615	14,390	15,255	16,180	72,280
Retirement Accrual e/	3,395	3,605	3,825	4,060	4,320	19,205
Enlistment Bonuses	60	110	170	200	235	775
Total	17,165	18,245	19,335	20,495	21,755	96,995

(Continued)

TABLE 3. (Continued)

Type of Cost	1987	1988	1989	1990	1991	Five-Year Total
			Army Program (69 Percent)			
Recruiting b/	260	275	285	295	305	1,420
Turnover c/	625	660	690	710	745	3,430
Pay and Benefits d/	12,840	13,615	14,390	15,250	16,180	72,275
Retirement Accrual e/	3,395	3,600	3,820	4,055	4,315	19,185
Enlistment Bonuses	80	155	235	270	320	1,060
Total	17,200	18,305	19,420	20,580	21,865	97,370

SOURCE: Congressional Budget Office.

a. Estimates of inflation and wage increases originate from CBO's medium-term economic projections.

b. Includes costs of examining and processing recruits, supporting the U.S. Army Recruiting Command, and the accrual cost of maintaining the Army College Fund (supplemental education benefits with an estimated accrual value of about $1,140 per high-quality recruit).

c. Includes variable expenses of training recruits--civilian salaries, ammunition, maintenance, and installations--amounting to about $1,600 a recruit. (Source: U.S. Army, *TRADOC Resource Factor Handbook*, vol. 2, Resource Estimating Relationships). Also, the expense of soldiers' travel between home and military installation (accession and separation permanent change of station moves).

d. Includes pays and allowances in the Military Personnel Account (such as basic pay, quarters allowance, reenlistment bonuses), plus operation and maintenance costs of medical care (inpatient and outpatient), plus reimbursement for travel not included in c.

e. Calculated as a percentage of basic pay, with the overall factor dependent on the composition of the enlisted force. For 1985, CBO calculates an accrual charge particular to the Army of 41.1 percent--about 10 percentage points less than the charge for all of the Defense Department that is used in budget calculations.

sums for enlisting. More popular alternatives for attracting personnel are education assistance and across-the-board raises in military pay.

Education Assistance

Relying on education assistance to draw high-quality recruits would raise the Army program's cost. Since young recruits generally prefer money now to money later, a given amount of education assistance--with its deferred benefits--will not attract as many as a bonus of equal size. Increased education assistance could therefore raise the costs of the Army's program by several hundred million dollars over the next five years.

Pay Increases

Raising military pay, either for recruits or for all personnel, would be a straightforward way of solving the personnel problem. A difficulty with increasing only starting pay, whether by bonuses or by other means, is "pay compression." The Congress has previously expressed concern that senior personnel are already paid too little relative to their juniors. A platoon sergeant (pay grade E-7) with more than 14 years of service earns 2.5 times more in basic pay than a private (pay grade E-1). An enlistment bonus of, say, $5,000 would compress the differential even more. Even though pay compression does not seem to have hurt the Army's ability to retain personnel, it could ultimately lessen career soldiers' motivation and reduce their productivity should they feel that high enlistment bonuses are unfair to them. 2/ An across-the-board raise would be one answer to the problem of compression. But such an approach would raise the cost of the Army's program by several billion dollars.

COSTS IN THE LONG RUN

Since five years is too short a period to appraise all the effects of a change in recruiting policies, CBO has also made a long-run projection that covers a period of 30 years. Table 4 shows how the Army's variable manpower costs (calculated in 1987 dollars) would change in the long term under the proposed new program. The 65 percent goal for AFQT categories

2. Some economists contend that, because of "interdependent" preferences, workers often look at their coworkers' wages to decide if they are being fairly paid. See Lester Thurow, *Dangerous Currents: The State of Economics* (New York: Vintage Books, 1984).

TABLE 4. LONG-RUN VARIABLE COSTS OF MANNING THE ACTIVE ARMY UNDER THE ARMY'S TWO ALTERNATIVE PROGRAMS (In millions of 1987 dollars) a/

Type of Cost	Baseline	65 Percent Program	69 Percent Program
Recruiting b/	305	345	370
Turnover c/	905	880	880
Pay and Benefits d/	16,840	16,880	16,865
Retirement Accrual e/	4,390	4,455	4,435
Enlistment Bonuses	110	325	450
Total	22,550	22,885	23,000

SOURCE: Congressional Budget Office.

a. Assumes that manpower related costs increase at a real rate of 1 percent a year (for a total of about 30 percent over the projection period).

b. Includes costs of examining and processing recruits, supporting the U.S. Army Recruiting Command, and the accrual cost of maintaining the Army College Fund (supplemental education benefits with an estimated long-run accrual value of about $1,480 per high-quality recruit).

c. Includes variable expenses of training recruits--civilian salaries, ammunition, maintenance, and installations--amounting in the long run to about $2,080 a recruit. (Source: U.S. Army, *TRADOC Resource Factor Handbook*, vol. 2, Resource Estimating Relationships). Also, the expense of soldiers' travel between home and military installation (accession and separation permanent change of station moves).

d. Includes pays and allowances in the Military Personnel Account (such as basic pay, quarters allowance, reenlistment bonuses), plus operation and maintenance costs of medical care (inpatient and outpatient), plus reimbursement for travel not included in c.

e. Calculated as a percentage of basic pay, with the overall factor dependent on the composition of the enlisted force.

I-IIIA would add $335 million to those costs, an increase of about 1.5 percent; the 69 percent goal would add $450 million, about a 2 percent increase. 3/

As in the five-year projections, higher enlistment bonuses would account for the largest part of the Army program's long-run costs. But growth in the career force, brought on by the 90 percent proportion of high school graduates, would trigger large increases in various other payroll costs. The Army's 65 percent program would expand the career force by 3,000 soldiers, and so would add $105 million to pay and benefits and retirement. The 69 percent program would add less--$70 million--because of a more modest career force expansion. (Since first-term soldiers in the top three AFQT categories are less likely than other first-termers to reenlist, the 69 percent AFQT goal would add only 1,900 career soldiers.) A larger career force would of course moderate other costs by holding down the demand for recruits, with likely savings of about $25 million a year in turnover-related costs.

The decrease in turnover accompanying the Army's program would make the enlisted force more efficient. With fewer recruits, the Army could maintain a smaller training establishment, and would require less overhead in general, for any given number of operating forces (such as combat divisions, and tactical support units). But such efficiencies would probably not be reflected in budgetary savings, because the services have to take many other influences into account in deciding their active manpower programs--the pace of modernization, the productivity of logistics units, the readiness of Reserve units, and the political mood, to name but a few. The Army's five-year manpower program is a good case in point. Despite large gains in retention over the last few years, the Army has held steady to earlier plans not to increase the size of the active force.

CONCLUSION

The Army's proposed standards for recruiting represent a historically ambitious program to raise the enlisted force's quality, at relatively small cost. Even the higher standard that would recruit 69 percent in AFQT categories I-IIIA, as well as 10 percent in category IV, with 90 percent high

3. In making these estimates, CBO assumed that manpower-related costs would generally increase at a real annual rate of 1 percent.

school graduates, might raise costs only modestly. Over the next five years, the annual cost of manning the Army would increase by $785 million, or slightly less than 1 percent of variable costs.

Such an increase seems small against the Army's total spending on pay and benefits, retirement, recruiting, training, and travel. Over the longer run, however, the program would be accompanied by an expansion in the career force that would raise payroll costs. In the long run, therefore, the Army program would add about 2 percent to total variable costs--discounting the possibility of hidden savings in the operating forces.

While small in proportion, such increases would represent a sizable expansion of today's recruiting resources. Moreover, the outlays could become considerably larger if the Congress chose to rely on education assistance, rather than higher enlistment bonuses, to attract enough recruits, or if it decided to raise pay across the board.

The uncertainty as to costs may be reason enough to consider a less far-reaching standard for recruit quality. But costs are only part of the story. Higher recruiting standards are intended to add to military effectiveness; would they increase effectiveness enough to justify the extra spending? To begin answering this question, Chapter IV discusses the case for manpower quality: the relationship of recruiting standards to military performance.

CHAPTER IV

THE RELATIONSHIP OF QUALITY TO PERFORMANCE

When the Army first began using tests of mental aptitude in 1917, a draftee with a very low test score was said by his commander to be "a model of loyalty, reliability, cheerfulness, and the spirit of serene and general helpfulness. . . .What," the officer asked, "do we care about his intelligence?" 1/ Though research has long since established the connection between measured aptitude and success in training, the longer-run connection between individuals' AFQT rank and their performance as soldiers is still at issue. This chapter draws upon a variety of research to discuss some of the questions basic to setting the Army's need for quality:

- How strong is the connection between mental aptitude, as measured by AFQT ranking, and individual performance during the first term of service?
- Is high school graduation also connected to individual performance during the first term?
- Does military experience weaken the connection, if any, between recruit quality and performance in the career force?
- What is the connection between individual recruits' quality and the performance of the groups (or teams) to which they belong?
- What effect will the Army's equipment modernization drive have on the need for quality?

Although researchers have drawn few firm conclusions, they agree that AFQT rank goes a long way to predicting individual performance during the first three or four years of service. Studies suggest that first-term

1. Daniel Kevles, "Annals of Eugenics: A Secular Faith," *The New Yorker* (October 15, 1984), p. 84.

soldiers who score in AFQT categories I-IIIA outperform lower-aptitude soldiers by 10 percent to 20 percent. High school graduation also contributes, in varying degrees, to first-term performance. Beyond these findings, connections between quality and performance are speculative. This chapter discusses how researchers measure performance, and details their results.

DEFINING PERFORMANCE

For years the military services have used written tests to sort through large numbers of recruits. In this respect they are a step ahead of civilian employers, only a handful of whom use written tests to distinguish acceptable from nonacceptable prospects. The military's tests have been developed to predict training success rather than job performance. Yet training requirements do not necessarily coincide with the requirements of military jobs. Training may favor those with good memory or strong verbal ability, as opposed to competence on the job. 2/ Hence the long-held realization that elements of on-the-job performance need more adequate identification to improve selection criteria. 3/

Using Proxies to Measure Performance

Ultimately, individual performance matters only to the extent it contributes to the Army's effectiveness as a fighting force. But measuring military effectiveness is intrinsically difficult. How, for instance, does one attach relative values to readiness and sustainability? Moreover, any army has multiple, continuous objectives and outputs that may vary with the situation. So difficult is measuring military effectiveness that some researchers believe it is futile to try. 4/

More often, researchers substitute proxies for measures of military output. They observe how individuals score on tests of job proficiency and job knowledge, how they are rated by their supervisors, and how fast they

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2. Milton Maier and Catherine Hiatt, *An Evaluation of Using Job Performance Tests to Validate ASVAB Qualification Standards* (Center for Naval Analyses, May 1984).

3. Paul Nelson, "Personnel Performance Prediction," in Roger Little, ed., *Handbook of Military Institutions* (Beverly Hills, Calif.: Sage Publications, 1971).

4. Nicholas Bond, Jr., *17th International Symposium on Applied Military Psychology* (London: Office of Naval Research, London Branch, U. S. Department of the Navy, July 1981).

are promoted. If AFQT I-IIIA soldiers do better than others against each proxy, then they probably contribute more to the Army's effectiveness.

Problems with Proxies

No proxy stands out as the best measure of performance on the job. Tests of job proficiency ("hands-on") and job knowledge have the seeming advantage of objectivity, since they show whether soldiers are able to perform the tasks specific to their specialties. But they may suffer from problems of measurement: how well do the tasks or questions actually reflect duties on the job? The Sergeant Major of the Army raised this concern about the Army's premier test of job knowledge, the Skill Qualification Test (SQT), a written exam that decides qualifications for promotion and reenlistment. He urged a more performance-oriented SQT that would test soldiers on "what they do every day rather than asking them a bunch of questions on theory and subjects they may not need to know for several years." 5/ Another problem is that soldiers generally take tests in a testing environment rather than in a natural job environment. And finally, tests of short duration may not allow scope for individual differences in motivation.

Different proxies may not necessarily act as substitutes for one another: each may measure a different aspect of ability. Some psychologists theorize that ability comes "bundled" into sets of know-how, into procedures for doing things. Some people excel in linguistic ability, the capacity to deal with verbally presented material, either in speech or in writing; others excel in spatial ability, the capacity to perceive the visual world accurately. 6/ Still others are strong in psychomotor ability, the capacity to coordinate perception and motor output, as in pointing a rifle. Correlations among different aspects of ability are, at best, modest. 7/

Problems in measuring performance (or output on the job) are not unique to the military. In the civilian sector, research into productivity at

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5. Sergeant Major of the Army Glen Morrell in *Army Times*, September 2, 1985.

6. Howard Gardner, *Frames of Mind: The Theory of Multiple Intelligences* (New York: Basic Books, 1983).

7. United State Army, Training and Doctrine Command, *Soldier Capability-Army Combat Effectiveness*, vol. 3 (December 1980), pp. A-5, A-6.

the level of the firm or establishment is still in the "dark ages." 8/ Companies often rely on supervisory ratings as proxies for output, just as economists are often reduced to using workers' earnings as a measure of productivity.

THE CONTRIBUTION OF QUALITY TO FIRST-TERM PERFORMANCE

Research on military performance yields one firm conclusion: during their first term of service, soldiers in the top three aptitude categories I-IIIA typically score higher on job tests, get better supervisory ratings, and receive faster promotions than lower-aptitude soldiers. The difference between AFQT I-IIIA soldiers (who place above the 50th percentile) and soldiers who are AFQT IIIB and IV (between the 10th and 50th percentiles) averages between 10 percent and 20 percent on these performance criteria. Averages, though, mask considerable variation. In many occupations, a substantial proportion of soldiers in AFQT categories IIIB and IV do as well or better than AFQT I-IIIA soldiers. And in some occupations AFQT scores appear to have relatively little bearing on performance.

The connection between high school graduation and performance is less certain. Studies based on job tests generally find that diplomas do not compensate for low AFQT scores. The typical AFQT I-IIIA high school dropout outperforms the typical graduate in AFQT category IV, though the dropout is less likely to complete the first term of service. These results suggest that the Army ought to give more weight to AFQT scores than to high school graduation, an important consideration since the Army usually has an excess of nongraduate and category IV recruits. But other studies, based on supervisor judgments of performance, rate high school graduates more highly.

AFQT and Performance

Strong connections between AFQT and performance emerge from job tests. A typical example appears in Table 5, which shows results from early job task tests prepared by the Human Resources Research Organization (HumRRO). The tests included tasks that soldiers would ordinarily perform as part of a single operation in performing one of four jobs: armor

8. Hinotaku Takeuchi, "Productivity Measurement at the Level of the Firm," in Nahil Adam and Ali Dogramaci, eds., *Productivity Analysis at the Organizational Level*, (Boston: Martinus Nyhoff, 1981).

TABLE 5. AVERAGE PERCENTAGE SCORES ON PERFORMANCE TESTS IN FOUR ARMY JOBS, BY AFQT CATEGORY AND EXPERIENCE

AFQT Category a/	Months on the Job		
	10-24	25-60	More than 60
		Armor Crewmen	
I-II	73	83	77
III	68	73	83
IV	62	72	82
Ratio of I-II to III	1.07	1.14	0.93
Ratio of I-II to IV	1.18	1.15	0.94
		Cooks	
I-II	67	68	80
III	66	63	75
IV	54	63	71
Ratio of I-II to III	1.02	1.08	1.07
Ratio of I-III to IV	1.24	1.08	1.13
		Repairmen	
I-II	76	90	87
III	71	76	83
IV	68	73	88
Ratio of I-II to III	1.07	1.18	1.05
Ratio of I-II to IV	1.12	1.23	0.99
		Supply Specialists	
I-II	69	73	75
III	64	74	75
IV	58	61	74
Ratio of I-II to III	1.08	0.99	1.00
Ratio of I-II to IV	1.19	1.20	1.01

SOURCE: Robert Vineberg and Elaine Taylor, *Performance in Four Jobs: The Role of Mental Ability and Experience*, Professional Paper 31-70 (Alexandria, Va.: Human Resources Research Organization, December 1970).

a. Categories I and II cover the percentile score range of 65 to 99. Category III includes percentiles 31-64. Category IV includes percentiles 21-30.

TABLE 6. EFFECT OF AFQT AND EDUCATION ON THE SIMULATED PROBABILITIES OF PASSING SKILL QUALIFICATION TESTS a/

Occupation and AFQT Category b/	High School Graduates	Non-graduates
Infantryman		
I	96	96
II	94	93
IIIA	89	87
IIIB	82	80
IV	73	69
Multichannel Communications Equipment Operator		
I	80	73
II	67	58
IIIA	45	36
IIIB	28	22
IV	16	12
Medical Specialist		
I	86	78
II	82	72
IIIA	75	63
IIIB	68	54
IV	60	46

SOURCE: Congressional Budget Office.

a. Simulations are for enlistees in fiscal years 1976 through 1980 who had served one to one and one-half years, based on statistical analysis by Richard Fernandez and Jeffrey Garfinkle, *Setting Enlistment Standards and Matching Recruits to Jobs Using Job Performance Criteria* (Santa Monica, Calif.: The Rand Corporation, January 1985).

The average AFQT I soldier was assumed to have an aptitude area score 20 percent above the mean score; the average AFQT II soldier, 15 percent above; the average AFQT IIIA soldier, 6.5 percent above; and the average AFQT IV soldier, 5 percent below. See the ability distribution of infantry recruits entering training in 1978, in David Armor and others, *Recruit Aptitudes and Army Job Performance: Setting Enlistment Standards for Infantrymen* (Santa Monica, Calif.: The Rand Corporation, September 1982).

b. Brief descriptions of each occupation appear in Appendix B.

crewman, cook, repairman, or supply specialist. During the first five years of service, high-AFQT soldiers scored significantly better than others, with those in AFQT categories I and II outperforming their category III peers by around 10 percent, and their category IV peers by roughly 20 percent. 9/

Amplifying these results, researchers at the Rand Corporation and in the Army have analyzed the connection between AFQT and performance on Skill Qualification Tests. The Rand analysts statistically controlled for a variety of variables (including AFQT score, education, and months on job) to calculate a soldier's probability of passing the SQT. 10/ CBO used Rand's figures to simulate the effect of AFQT, as shown in Table 6. First-term infantrymen who are high school graduates in AFQT categories I-IIIA are about 15 percent more likely than AFQT IIIB graduates to pass the SQT; AFQT I-IIIA high school dropouts are about 10 percent more likely than AFQT IIIB graduates to pass. AFQT rank is important for first-term medical specialists, but in that job high school graduation also has a strong effect on performance; AFQT IIIB graduates are about 8 percent more likely than AFQT IIIA nongraduates to pass the SQT.

The Army analyzed data from job sample tests (including the SQT) for numerous military occupations. Tables 7 and 8 feature typical results, which corroborate other researchers' findings. Though occupational differences are important, high-aptitude soldiers outperform their lower-aptitude peers on job tests by significant percentages. The Army also found that speed of promotion (from pay grades E-4 to E-5, and from E-5 to E-6) is also related strongly to AFQT, even though promotion boards do not have access to AFQT scores (see Table 9). High school graduates in AFQT category II reach grades E-4 and E-5 about 10 percent sooner than graduates in category IIIB. High school graduation itself has some importance, in that nongraduate soldiers who are AFQT II generally get promoted only slightly faster than graduates who are AFQT IIIB. (In one occupation, Unit Supply, AFQT IIIB graduates actually do better than higher-aptitude nongraduates.)

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9. Robert Vineberg and Elaine Taylor, *Performance in Four Jobs: The Role of Mental Ability and Experience*, Professional Paper 31-70 (Alexandria, Va.: Human Resources Research Organization, December 1970).

10. Rand looked at SQT data for skill level 2, which signifies proficiency needed up to pay grade E-5. See Richard Fernandez and Jeffrey Garfinkle, *Setting Enlistment Standards and Matching Recruits to Jobs Using Job Performance Criteria* (Santa Monica, Calif.: The Rand Corporation, January 1985).

TABLE 7. AVERAGE SCORES ON PERFORMANCE TESTS AMONG SOLDIERS IN SELECTED OCCUPATIONS BY AFQT CATEGORY (Percent correct)

Occupation a/	I-IIIA	IIIB	IV	Ratio of I-IIIA to: IIIB	Ratio of I-IIIA to: IV
LANCE Missile Crewman	72	70	67	1.03	1.07
HAWK Missile Crewman	65	57	44	1.14	1.48
HAWK Fire Controller Crewman	74	62	55	1.19	1.35
HAWK Firing Section Mechanic	89	86	83	1.03	1.07

SOURCE: *Defense Manpower Quality*, Army Submission (May 1985), Appendix F.

a. Brief descriptions appear in Appendix B.

TABLE 8. PROBABILITIES OF PASSING SKILL QUALIFICATION TESTS AMONG SOLDIERS IN VARIOUS OCCUPATIONS, BY AFQT CATEGORY a/

Occupation b/	I	II	IIIB	IV	Ratio of II to: IIIB	Ratio of II to: IV
Administrative Specialist	68	59	41	29	1.44	2.03
Cavalry Scout	95	90	74	51	1.22	1.76
Infantryman	98	97	91	81	1.07	1.20
Radio Teletype Operator	98	97	93	87	1.04	1.11
Light Wheel Vehicle Mechanic	99	99	98	98	1.01	1.01

SOURCE: *Defense Manpower Quality*, Army Submission (May 1985) Appendix I.

a. Simulated for high school graduates at skill level 2 after 20 months' service.

b. Brief descriptions appear in Appendix B.

TABLE 9. EXPECTED TIME OF PROMOTION AMONG SOLDIERS IN SELECTED OCCUPATIONS, BY EDUCATION AND AFQT CATEGORY (In months)

Occupation a/	High School Graduates			Nongraduates
	II b/	IIIB c/	IV d/	II b/
	From E-4 to E-5			
Infantryman	22.0	23.9	25.4	22.6
M-60 Armor Crewman	20.3	22.2	23.9	21.7
Administrative Specialist	49.3	58.9	67.6	58.1
Unit Supply Specialist	31.5	33.8	35.9	34.8
	From E-5 to E-6			
Infantryman	30.8	32.6	34.2	32.2
M-60 Armor Crewman	28.0	31.5	34.6	29.2
Administrative Specialist	118.3	130.3	138.8	130.2
Unit Supply Specialist	37.1	39.5	41.5	39.8

SOURCE: *Defense Manpower Quality*, Army Submission (May 1985), Appendix G.

a. Brief descriptions appear in Appendix B.
b. Based on soldier with an AFQT percentile score of 65.
c. AFQT percentile score of 40.
d. AFQT percentile score of 20.

Limits to the AFQT Results. Though a strong relationship exists between score on the AFQT and performance, many recruits in AFQT categories IIIB and IV make fine soldiers, while some high-aptitude recruits do not. HumRRO's job tests revealed that one category IV soldier out of three scored in the upper half of the performance distribution, while one AFQT I-IIIA soldier out of four scored in the lower half. More recent SQT data offer corroboration, since in many occupations AFQT scores explain less than one-fifth of the variation in individuals' performance on the SQT. Similar results hold when analyzing the civilian earnings of former service members--AFQT scores are only one of many factors affecting total performance. 11/

11. An analysis of veterans who served one term of military service found that AFQT has a positive, though generally weak, effect on their earnings. See Adele Massell and Gary Nelson, *The Estimation of Training Premiums for U.S. Military Personnel* (Santa Monica, Calif.: The Rand Corporation, June 1974).

High School Graduation and Performance

While job performance tests emphasize the importance of mental aptitude, other measures suggest that education is the crucial factor. A large-scale survey of supervisors--the Rand Corporation's Enlisted Utilization Survey--gave high school graduation priority over high AFQT rank in accounting for successful performance. The survey covered 16 occupations in the Army and 32 in the other services. Supervisors rated the "net" productivity of trainees at different points during their first terms, relative to an average specialist with four years of experience. (Net productivity takes into account the time forgone by senior personnel in supervising on-the-job training.) Using these ratings to construct profiles of enlisted productivity over the first term, analysts have found, for example, that the typical infantryman just out of basic training is only one-third as productive as the average infantryman with four years of service; after just one year, the new infantryman is well over one-half as productive.

By the end of their first terms, according to these supervisory ratings, high school graduates are generally more productive than nongraduates, though AFQT scores still affect performance (see Table 10). High-aptitude high school graduates generally received the top ratings. Supervisors judged soldiers in category IV about 10 percent less productive than those in categories I-III. Category IV high school graduates, however, were rated more productive than most nongraduates, except in high-skill jobs. As Chapter I brought out, graduates are far more likely than dropouts to complete the first term of service. Perhaps this tenacity signals greater motivation on the job, which could have been a key factor in supervisors' judgments.

Value of High School Graduation. Why should high school graduates make better soldiers? One reason may be education's socializing effect. Along with geometry, chemistry, and English, schools teach the psychological attitudes and social behaviors required of adults. Students learn to function routinely, over long periods, in roles that conform to teachers' expectations. The development of these "affective" characteristics (as opposed to "cognitive" skills in advanced reading and science) may be the central means by which education enhances on-the-job success. 12/

12. Herbert Gintis, "Education, Technology, and the Characteristics of Worker Productivity," in American Economic Association, *Papers and Proceedings of the Eighty-Third Annual Meeting, 1970* (*American Economic Review*, vol. 61, May 1971).

TABLE 10. ESTIMATED PRODUCTIVITY OF SOLDIERS AFTER FOUR YEARS OF MILITARY SERVICE, BY SKILL, EDUCATION, AND AFQT CATEGORY a/

Skill and Education		AFQT Category I	II	III	I-III	IV
All Jobs	HSDG b/	109	103	100	102	95
	Non-HSDG	96	90	83	85	75
High Skill c/	HSDG	111	103	93	104	83
	Non-HSDG	*	98	95	96	*
Medium Skill d/	HSDG	106	104	100	104	95
	Non-HSDG	103	94	83	88	94
Low Skill e/	HSDG	105	101	99	100	96
	Non-HSDG	*	83	82	82	72

SOURCE: Richard Cooper, *Military Manpower and the All-Volunteer Force* (Santa Monica, Calif.: The Rand Corporation, September 1977), p. 139.

NOTE: Asterisks indicate there were fewer than 10 observations in the Enlisted Utilization Survey.

a. Productivity expressed as a percentage relative to the average fully-trained soldier with four years' experience. Estimates were normalized so that the entire population averaged 100 percent.
b. High school diploma graduate.
c. Army occupations: Microwave Systems Repair, Field Radio Repair.
d. Army occupations: Track Vehicle Repair, Helicopter Repair, Finance, Medical Specialist.
e. Army occupations: Infantryman, Combat Engineer, Cannon Crew, Carpentry and Masonry, Motor Transport, Food Service.

Private employers are quite concerned about the social attitudes of young employees. When asked what they look for in new workers, they overwhelmingly prefer youths who "can be counted on to come to work regularly and on time; will easily accept supervision; and are able to get along well with people." 13/ This may go far to explain why military supervisors judge low-aptitude high school graduates superior to higher-aptitude nongraduates.

13. Robert Crain, "What Do Employers Really Think About the Quality of American High Schools?," *National Association of Secondary School Principals Bulletin*, vol. 69 (April 1985).

QUALITY VERSUS EXPERIENCE

Though the evidence suggests that high-quality recruits outperform other first-term soldiers, quality may at some point have an unfavorable trade-off with experience. Since high-aptitude soldiers reenlist at comparatively low rates, the career force will decline as the proportion of recruits in categories AFQT I-IIIA increases. Can a smaller though higher-quality career force be as effective as a larger career force of lower quality? Unfortunately, evidence on this important question is contradictory. Even the Army admits having too little data to draw final conclusions on the trade-off between experience and recruit quality.

Military Evidence on Experience

Many factors may weaken the relationship between aptitude and job performance during a recruit's first term. On-the-job training may improve the performance of lower-aptitude soldiers. So too may changes in assignment, marital status, or maturity. 14/ The job tests conducted by HumRRO suggest that experience on the job attenuates differences in performance (see Table 6). Over the first five years of service, soldiers in low AFQT categories learned the same job skills as others, but at a slower rate. After the fifth year, scores among the AFQT groups generally converged. (Whether this resulted from job experience or from an interaction of experience and selection--reenlistment, reassignment--cannot be certain.)

Army researchers found similar results after comparing scores for combat potential (taken from a subtest of the Armed Services Vocational Aptitude Battery) with the performance of tank gunners and drivers. Test scores correctly predicted that smarter people learn better during training. But when more experienced men were tested, aptitude made no difference, suggesting that gunners and loaders gained competence with experience. 15/ In this case, high aptitude chiefly signified the ability to acquire job skills rapidly.

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14. Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics), *Department of Defense Efforts to Develop Quality Standards for Enlistment* (December 1981).

15. James Kahan and others, *Individual Characteristics and Unit Performance: A Review of Research and Methods* (Santa Monica, Calif.: The Rand Corporation, February 1985).

Other results suggest that high-aptitude people do comparatively better with experience, whether in the military or in the civilian sector. 16/ It may be they are able to use skills learned early in their careers more rapidly, and to acquire even more complex skills. When the Army analyzed firing range performance by tank crews under enlisted command, gunners' and commanders' AFQT scores were significantly related to the crews' overall performance; their experience was less so. 17/

Civilian Evidence on Experience

Economists have found that ability has a small but significant effect on the earnings of experienced civilian employees (at least through age 40). To generalize from two such studies, a typical high school graduate with just below-average aptitude (equivalent to AFQT category IIIB) might earn about 4 percent less than a graduate with above-average aptitude (categories I-IIIA); a graduate who is markedly below average (category IV) might earn about 8 percent less. 18/ Such effects of aptitude are not greatly different from those found in the first term of military service. Nevertheless, the link between ability and earnings does not necessarily establish a connection between earnings and performance. Labor markets do not always behave according to the postulates of marginal productivity theory, in which employers pay higher wages to their more productive workers. In practice, workers often get paid less than their marginal products. 19/

INDIVIDUAL QUALITY AND TEAM PERFORMANCE

The preceding discussion centered largely around individual performance. But military effectiveness depends upon performance as members of a team,

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16. See John Hause, "Earnings Profiles: Ability and Schooling," *Journal of Political Economy*, vol. 80, no. 3, Part II (May/June 1972).

17. The Army simulated "tank-equivalent kills" to illustrate the relative importance of AFQT. About one-third of tank crews in the Army's sample were commanded by officers. See "Are Smart Tankers Better Tankers: AFQT and Military Productivity," in Department of Defense, *Defense Manpower Quality*, Appendix C, p. 19.

18. See John Hause, *op. cit.*, and Zvi Griliches and William Mason, "Education, Income, and Ability," *Journal of Political Economy*, vol. 80, no. 3, Part II (May/June 1972).

19. Peter Gottschalk, "A Comparison of Marginal Productivity and Earnings by Occupation," *Industrial and Labor Relations Review*, vol. 31, no. 3 (April 1978).

rather than as individuals. Many military duties require cooperation and coordination, whether it be food specialists preparing meals or armor crewmen engaging enemy tanks in battle. Effectiveness comes down to success for the group as a whole, not for individuals. Research suggests that high individual ability improves team performance, but that not all team members may need high ability to ensure good team performance.

A Rand Study

As soldiers learn to work together in a team, their overall performance should improve. 20/ But how individual ability enters into the dynamics of team performance is not well understood. The complex interactions that take place in most team activities make it exceedingly difficult to isolate and measure the contribution of any individual to overall performance. 21/

Researchers at the Rand Corporation reviewed the literature on small group performance, looking into such questions as whether a single high-aptitude member can make up for a lower average degree of aptitude, or whether a single low-aptitude member might drag down an entire team's performance. They found that the relationship between individual abilities and team performance depends on the nature of the group's tasks. Sometimes the proficiency of the least-able member will correlate with success--as when tasks require contributions by all group members--but results are often ambiguous. Their most interesting finding may be that groups composed of all high-ability members do not necessarily perform better than groups composed of members with moderate abilities or with a range of abilities. Clearly, other factors besides individuals' abilities (such as attitudes) affect group performance. 22/

Insights from the Army's Tank Crew Analysis

For empirical evidence on team performance, the Army analyzed data from a tank firing range. It statistically related the scores of individual tank

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20. In private industry, learning curves provide evidence of team productivity. These occur when the labor time necessary to produce a unit of output declines dramatically over the first three or four years of production, even though workers and equipment stay the same. Workers hone their existing skills and learn new ones through experience--but they also learn to work together as a team. See Lester Thurow, *Dangerous Currents: The State of Economics* (New York: Vintage Books, 1984), pp. 204-205.

21. R. H. Frank, "Are Workers Paid Their Marginal Product?," *American Economic Review*, vol. 74, no. 4 (September 1984), p. 555.

22. James Kahan and others, *op. cit.*, p. 46.

crews--which include a tank commander, a gunner, a loader, and a driver--to the crewmembers' AFQT scores, education, time in position, and time in service. Crews manned either the M-60 or the new M-1 Abrams.

The Army found that AFQT scores of commanders and gunners are significant determinants of overall performance, expressed as the number of "tank-equivalent kills." Crews whose gunner and commander are both in AFQT category I score more tank equivalent-kills than other types of crews, particularly on the M-60 tank. Table 11 shows the number of kills that Army analysts predict for different types of crews; one in which both the commander and the gunner are in AFQT category IIIB serves as a "benchmark crew."

On the M-60 tank, the presence of a single low-aptitude crewman significantly reduces unit performance. Replace the benchmark's gunner or commander with an AFQT IV crewman, and tank-equivalent kills drop at

TABLE 11. EFFECTS OF CREWMEMBERS' AFQT SCORES ON TANK CREWS' PERFORMANCE

Gunner's AFQT	Tank Commander's AFQT									
	I	II	IIIA	IIIB	IV	I	II	IIIA	IIIB	IV
	Number of Tank-Equivalent Kills					Percentage Change from Benchmark Crew				
M-60 Tank										
I	10.2	9.9	9.5	9.0	8.1	37	33	27	20	8
II	9.8	9.5	9.1	8.6	7.8	31	27	22	15	4
IIIA	9.2	8.9	8.5	8.1	7.3	23	19	14	8	-3
IIIB	8.5	8.3	7.9	7.5	6.7	14	11	6	0	-10
IV	7.4	7.2	6.3	6.5	5.8	-1	-4	-16	-13	-22
M-1 Tank										
I	12.8	12.7	12.7	12.6	12.5	10	10	10	9	8
II	12.5	12.5	12.4	12.4	12.3	8	8	7	7	6
IIIA	12.1	12.1	12.1	12.0	11.9	5	5	4	4	3
IIIB	11.7	11.7	11.6	11.6	11.5	1	1	0	0	-1
IV	10.9	10.9	10.9	10.8	10.7	-6	-6	-6	-7	-7

SOURCE: Barry Scribner and others, "Are Smart Tankers Better Tankers: AFQT and Military Productivity," in Report to the House and Senate Committees on Armed Services, *Defense Manpower Quality*, Army Submission (May 1985).

least 10 percent. Put AFQT IV soldiers into both positions, and the performance deficit doubles. Conversely, while a single high-aptitude gunner or commander raises the number of tank-equivalent kills, performance improves most when both key crewmen are in the upper AFQT categories. Crews with both an AFQT I gunner and commander score 37 percent more kills than the benchmark crew.

Results differ on the newer M-1 tank, where the tank commander's AFQT rank is not as important, nor the disparity among crews as wide, as on the M-60 tank. Replace the benchmark crew's commander with one in either AFQT category I or IV, and little changes. In contrast, a high-aptitude gunner not only improves performance, but makes up for a low-aptitude commander. A crew with an AFQT category I gunner, whatever the AFQT of its commander, kills 8 percent to 10 percent more tank-equivalents than the benchmark crew.

Clearly, individual ability matters for successful team performance, but not all crew members need be of high aptitude. The loader and the driver--one-half of a tank's crew--can be of low aptitude without affecting performance. And on the M-1 tank, which eventually will displace the M-60 in active Army units, the commander's AFQT is relatively unimportant, so long as the gunner is highly able. Whether these results carry over into other team activities is uncertain. If so, the Army might want to favor category IV high school graduates over higher-aptitude nongraduates; attrition would improve, with little damage to team performance.

COHORT Gains

The COHORT program (Cohesion, Operational Readiness, and Training) trains soldiers together as a unit, and periodically deploys them overseas as a unit. Its purpose is to improve combat readiness and fighting ability by fostering a strong sense of group identity. The continued expansion of COHORT units might further the Army's capacity to absorb lower-quality recruits.

To date, COHORT units show improvement over regular units on several counts: higher personnel stability, lower attrition, and higher SQT scores. 23/ Indeed, the Army's tank crew data offer analytic evidence that keeping units together is beneficial. Increasing a gunner's time in position from two months to twelve months raises his crew's tank firing score about 6 percent.

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23. Department of Defense, *Manpower Requirements Report for Fiscal Year 1986*, vol. 3 (February 1985), p. III-16.

WEAPONS MODERNIZATION AND MANPOWER QUALITY

For several years the Army has been carrying out a far-reaching program of equipment modernization. Dozens of new weapon systems will enter the active-duty inventory in increasing numbers over the next few years. Some are new versions of older, less complex systems--the M-1 Abrams tank, for instance, or the new Single Channel Ground and Airborne Radio System (SINCGARS). Others, like the Multiple Launch Rocket System (MLRS), represent brand-new concepts. As modernization proceeds, will the previously discussed research lose its relevance? The answer may be no, because the Army's future requirements for personnel are likely to resemble today's, both in the balance between more technical and less technical jobs, and in the skills needed to excel in any particular job.

The Balance of Jobs

Despite the array of new weapon systems, the Army expects a change of less than 4 percent in the number of positions it describes as "Very Technical." 24/ The term Very Technical applies to one of five occupational groupings devised by the Army (the others being Combat, Semi-Skilled, Administrative, and Technical). It defines a broad category including soldiers who operate and maintain advanced electronic equipment (such as aerial radar sensor repairers, tactical computer systems repairers, and ground surveillance systems operators), communications and intelligence specialists, medical specialists, and some soldiers whose jobs are not typically thought of as very technical (such as practical nurses and tank turret repairers). Since only about one-third of new recruits enter such occupations, the overall proportion of recruits needed for very technical jobs should rise by only about one percentage point. 25/

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24. Projections of military skill needs are subject to wide margins of error. Many factors influence occupational requirements besides technological innovations, including major strategic decisions, force structure changes, and future staffing policies. See Harold Wool, *The Military Specialist: Skilled Manpower for the Armed Forces* (Baltimore: The Johns Hopkins Press, 1968).

25. The Army might benefit from rising technical standards in the other services. Both the Air Force and Navy are experiencing sizable increases in the percentage of very technical jobs. As the roster of technical jobs grows--thus boosting, on average, the minimum aptitude score on the ASVAB needed for enlistment--the pool of youths qualified to serve in either the Navy or Air Force will shrink. Some of those disqualified youths (many of whom would still be in high AFQT categories, or high school graduates) would enlist in the Army, thus offsetting some of the projected decline in recruiting.

Skill Requirements

Though the balance of jobs is unlikely to change much, advances in weapons technology may change the skill requirements of individual jobs. On the one hand, new systems tend to be more complex than their predecessors, placing greater emphasis on computerized command, control, communications, and intelligence functions. 26/ Requirements for maintaining the new generation of communications-electronic equipment could become particularly complex; some analysts believe that their internal diagnostic features (built-in test equipment) do not work very well because faults occur in combinations that require a mastery of troubleshooting. 27/

On the other hand, emerging technology may simplify the operation of new systems and reduce their maintenance. Systems of similar functional complexity have tended to become more, not less, reliable as they have progressed from transistor to integrated circuit technology. 28/ Further, the Department of Defense has argued that the emergence of automatic test equipment (ATE) and built-in test equipment will greatly improve productivity: one Air Force study showed that ATE provided a 50-to-1 to 100-to-1 test-time reduction over manual testing for digital circuit boards. 29/ The Secretary of Defense states that the readiness of the land forces has improved as more reliable, easier-to-maintain equipment has entered the inventory. 30/

The case of the M-1 Abrams tank underscores the potential of new technology for improving performance. During its development and testing, the M-1 received a good deal of adverse publicity. Yet on the tank firing range, M-1 crews outshoot the older M-60 series tank by more than 40 percent. Mere important, the new tank reduces the importance of mental ability. Whereas on the M-60 tank, crews of AFQT category I soldiers

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26. Martin Binkin, *America's Volunteer Military: Progress and Prospects* (Washington, D.C.: The Brookings Institution, 1984), pp. 35-38.

27. General W. DePuy, USA (Ret), *The All Volunteer Force--The Demand Side--Army Perspective*, paper delivered at the All-Volunteer Force Conference, Annapolis, Maryland (November 1983).

28. Seymour Deitchman, *Military Power and the Advance of Technology* (Boulder, Colorado: Westview Press, 1984), pp. 224-225.

29. Statement of William Perry, Under Secretary of Defense for Research and Engineering, before the Senate Armed Services Committee, December 4, 1980.

30. *Annual Report of the Secretary of Defense, Fiscal Year 1986*, p. 137.

typically score almost 80 percent more "tank-equivalent kills" than do crews of category IV soldiers, on the M-1 tank the higher-ability crews score only 20 percent more kills. Indeed, the test results suggest that an M-1 crew composed entirely of AFQT category IV soldiers should be able to kill more enemy tanks than an M-60 crew composed entirely of soldiers in category I.

The key point is that modernization of itself does not necessarily pose an urgent need for improved recruit quality. To be sure, the empirical evidence presented here argues strongly against revisiting the years of 1979 and 1980, when five recruits out of ten were in the lowest acceptable AFQT category. Such a reversal would surely degrade performance. But given the cost of attracting high-quality recruits, how much quality can the Army afford? Chapter V takes up this issue in detail.

CHAPTER V

ALTERNATIVES TO THE ARMY'S PROGRAM

Military capability forms the ultimate justification for recruiting soldiers of high quality. Recruits with above-average mental aptitude or high school diplomas tend to make better than average soldiers, as evidenced by their performance on job-related tests, by their rates of promotion, and by their supervisors' ratings. The Army's program for recruiting would almost certainly make for a more effective fighting force--and a more expensive one. By CBO's estimate, the Congress might have to fund up to an additional $785 million over the next five years to support the Army's recruiting objectives.

Against the backdrop of a $75 billion budget for the active Army, $155 million a year to improve quality may seem modest. Still, at a time of widespread concern about the federal deficit, the Congress may view any real increase in defense spending as significant. The cost of the Army's program could well be higher than the above estimate, particularly if the Congress shies away from enlistment bonuses as the instrument to attract more high-quality recruits.

Nor does the Army's continuing modernization necessarily pose an urgent need for improving quality. Over the next five years, the Army will need comparatively few new additional recruits for very technical skills. Moreover, advances in military technology may make many of today's skilled jobs less demanding, particularly as computers become more powerful, smaller, and less expensive. By performing more sophisticated mental functions, they may therefore supplement the Army's need for high-quality personnel. 1/

At a time of budgetary stringency, the Congress may want to spend less on recruiting rather than more. It may therefore want to consider alternatives to the Army's program. Rarely does the Congress control quality directly; usually it does so through the funding of military pays and

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1. Russell Rumberger, "High Technology and Job Loss," *Technology in Society*, vol. 6 (1984), p. 278.

benefits that influence recruitment. This chapter looks at three alternative strategies for military pay, each less costly than the Army's program, and estimates their likely effects on the quality of personnel:

- The Congress could hold the line on spending, and so keep recruiting resources constant in real terms over the next five years, rather than letting them grow as the Army's program would require;
- The Congress could reduce recruiting resources for one year (thus repeating past actions) by suspending enlistment bonuses and pay raises for junior personnel in 1987; or
- The Congress could reduce recruiting resources for several years in a row by limiting pay raises for junior personnel through 1989, in addition to suspending the enlistment bonus program in 1987.

Ultimately, the Congress will have to weigh budgetary cost against personnel quality in deciding on a level of support for Army recruitment. This chapter reviews the pros, and discusses some possible cons, of the Army's program. It then judges the effects of the three cost-saving alternatives.

ADVANTAGES OF THE ARMY'S PROGRAM

Under the Army's program, the quality of enlisted manpower would stay at an all-time high: 90 percent of recruits would hold high school diplomas, between 65 percent and 69 percent would score in AFQT categories I-IIIA, and only 10 percent would score in the bottom acceptable category (IV). As a result, the first-term enlisted force would almost certainly become more capable than it is now. Because high school graduates are much more likely than nongraduates to complete military training, personnel turnover would diminish. And the typical junior soldier would probably be more productive: soldiers above the 50th percentile on the AFQT perform 10 percent to 20 percent better than their lower-aptitude peers.

Because high-aptitude soldiers reenlist in comparatively low numbers, the career force would lose personnel under the Army's program. In spite of this, the career force's overall performance might improve because a higher percentage of senior personnel would be in the top three AFQT categories. Though not definitive, some evidence suggests that high-aptitude soldiers are more capable than those of lower aptitude in raising their productivity through job experience.

These improvements in soldiers' performance, argues the Army, would be cost-effective, because they would raise the enlisted force's overall capability by a greater percentage than they would increase its cost. Under the key assumption that the average AFQT I-IIIA soldier performs 10 percent better than the average AFQT IIIB soldier, the Army calculated that a four-percentage-point increase in AFQT I-IIIA content (from 65 to 69 percent) would improve the enlisted force's overall performance by roughly 0.40 percent. Further calculations showed that the portion of the Army budget directly associated with manning the enlisted force would increase by only 0.30 percent. Hence, the Army concluded that a 69 percent goal for AFQT I-IIIA recruits is cost-effective.

DRAWBACKS TO THE ARMY'S PROGRAM

Despite the above findings, critics may object to the Army's program on two disparate grounds. First, the Army should perhaps not seek higher average quality than that of the population as a whole. Second, the cost-effectiveness of the program is open to question. The next few sections detail these objections.

Representativeness

The Army's program would lead to a service that was not representative of youths in general. Of young men 18 to 23 years of age eligible to serve in the military, 59 percent belong in AFQT categories I-IIIA and about 25 percent in AFQT category IV. About 77 percent hold high school diplomas. A conscripted Army in wartime would almost certainly represent a lower level of quality than envisioned by the Army's program. The Office of the Assistant Secretary of Defense has therefore stated that it would be concerned only if recruits' quality fell below the average of the eligible youth population. 2/

The ambiguity of the empirical evidence may also favor a population-based standard. Efforts to measure military performance show results that are contradictory or vague on many important points, such as the value of high school diplomas versus high AFQT scores; of quality versus experience; and of individual versus team performance. Indeed, considerable work remains to be done in refining and validating measures of job performance. 3/ Until more is known, some people say, the surest course for Army recruiting is to avoid falling below the average of the population.

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2. *Defense Manpower Quality*, vol. 1 (May 1985) p. 79.

3. Ibid.

Cost-Effectiveness

The second objection to the Army's program centers around its cost-effectiveness. CBO found, after building a simple analytic framework for measuring the enlisted force's overall productivity, that the Army's cost-effectiveness claim invites questioning. Indeed, recruiting a lesser degree of quality might eventually achieve more productivity at less cost.

CBO bases its results on an index designed to show the long-run implications of various recruitment and compensation strategies. 4/ It classifies soldiers into 18 groups defined by aptitude, education, and experience. Since relative performance depends to some extent on personal characteristics and experience, some groups of soldiers are "worth" more than others. For instance, first-term soldiers in the top three AFQT categories should be more productive than first-termers in AFQT category IIIB--CBO assumes about 10 percent more productive, in line with the empirical evidence discussed in Chapter IV. But a lower-aptitude soldier who has served for more than 20 years might well contribute more to the Army's effectiveness than any first-termer, no matter how bright.

CBO estimated relative productivities for the 18 groups of soldiers under various assumptions. A base case appears in Table 12. It assumes that both AFQT and high school graduation influence first-term performance, that the typical AFQT I-IIIA graduate outperforms the typical AFQT I-IIIA nongraduate, that the first-term effects of AFQT persist in the career force, and that enlisted productivity increases substantially with experience. Alternative assumptions that CBO tested include the following:

- High school graduates outperform nongraduates regardless of AFQT; or high school graduation has no effect on first-term performance;
- The effects of AFQT diminish in the career force; or the effects of AFQT disappear; and
- Enlisted soldiers' productivity increases fairly modestly with experience.

Appendix A details these alternative assumptions and explains their origin.

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4. Analysts at the Rand Corporation first suggested this approach. See David Jacquette and Gary Nelson, *The Implications of Manpower Supply and Productivity for the Pay and Composition of the Military Force: An Optimization Model* (Santa Monica, Calif.: The Rand Corporation, July 1974).

TABLE 12. RELATIVE PRODUCTIVITIES OF ENLISTED SOLDIERS UNDER BASE-CASE ASSUMPTIONS a/

Education and Experience	AFQT Categories I-IIIA	IIIB	IV
	First-Term Force b/		
High School Graduate	0.77	0.70	0.63
Nongraduate	0.70	0.63	-- c/
	Career Force		
Years of Military Service			
5 to 8	1.00	0.91	0.82
9 to 12	1.28	1.16	1.05
13 to 16	1.51	1.37	1.24
17 to 30	1.75	1.59	1.43

a. Relative to a fully-trained AFQT I-IIIA soldier with five to eight years of military experience.

b. Soldiers with less than five years' experience.

c. The Army does not enlist non-high school graduates who place in the lowest acceptable AFQT category.

For any combination of the above assumptions, CBO's index shows the overall productivity of a specified enlisted force. For example, suppose the percentage of AFQT I-IIIA recruits stays at 65 (as proposed in the Army's program) but the percentage of high school graduates rises from 69 to 94. 5/ In the long run, two things happen as the graduate percentage rises:

5. An overall high school graduate percentage of 69 percent includes females; it corresponds roughly to 65 percent male high school graduates, the statutory minimum.

the number of career soldiers increases because of lower attrition, and more of those soldiers are in AFQT categories I-IIIA. Table 13 shows how this affects overall productivity. In the base case, each three to four percentage-point increase in high school graduates registers about a 0.30 percent gain on the productivity index. Under alternative assumptions, the productivity gain varies from 0.10 percent to 0.45 percent.

Manpower-related costs would also vary. To support increasingly higher percentages of high school graduates, the Army would need more and more high-quality recruits, meaning substantial growth in the costs of recruitment--offset somewhat by savings from lower turnover. CBO projects that in the base case, over the full range of high school graduate percentages, the long-run variable cost of manning the enlisted force would rise from $22.4 billion to $23.0 billion, an increase of about 2.7 percent. The other two cases--see Table 13--yield a range of 2.1 percent to 3.4 percent.

To show the cost-effectiveness of its recruiting program, the Army compared an estimated increase in soldiers' performance of 0.4 percent with a growth in costs of 0.3 percent. This may not be an entirely appropriate comparison, since from the standpoint of national security a given percent gain in performance might be worth more or less than an equal percent increase in cost, depending on its contribution to U.S. ability to deter or fight wars. But accepting the Army's measure of cost-effectiveness, CBO's analysis still raises questions about the program.

As recruit quality increases to the levels desired by the Army, costs may be expected to rise faster than overall productivity. Under base-case assumptions, increasing the high school graduate percentage from 76 to 90 (while holding the AFQT I-IIIA percentage at 65) would raise overall productivity by 1.1 percent, while costs would grow by about 1.8 percent. Other assumptions produce similar results. Only when CBO's index makes comparatively strong assumptions about relative productivity (the "high case" in Table 13), and a low assumption about the appropriate earnings base, does an increase to 90 percent high school graduates appear to be strongly "cost-effective."

Nor does CBO's analysis necessarily support the Army's objective for AFQT I-IIIA recruits. Increasing their percentage from 65 to 69 (while holding the percentage of high school graduates at 90) would increase productivity by about 0.25 percent, but costs by roughly 0.50 percent. And while productivity would fall if the Army recruited fewer than 65 percent AFQT I-IIIA, costs might fall faster. Table 14 presents results for a 61.5

percent case, the proportion actually recruited in 1983: at 90 percent high school graduates, 65 percent may be less cost-effective than 61.5 percent.

One reason these results differ from the Army's is that CBO takes a more conservative approach to calculating a baseline for costs. The Army, in addition to counting soldiers' pays and benefits, included most of its expenses for operating and maintaining barracks, training bases, medical facilities, family housing, and so on--a large part of which would be likely to stay fixed even as the composition of the enlisted force changed. 6/ CBO, in contrast, included only those operation and maintenance expenses that would vary with changes in the enlisted force. The smaller baseline means, of course, lower percentage changes from equal changes in quality-related costs.

As Chapter V showed, attempts to measure the Army's output are fraught with difficulty. Researchers have to substitute proxies in the form of promotion rates, job-test scores, or supervisory ratings, on the assumption that increases in these translate into more military capability. Moreover, the definition of some manpower costs is itself sensitive to alternative assumptions. Allowing for these difficulties, critics appear to have grounds for questioning the cost-effectiveness of the Army's program.

ALTERNATIVES TO THE ARMY'S PROGRAM

What follows is a discussion of three alternative approaches to the Army's program for recruiting. Table 15 summarizes their effects.

Alternative I: Hold the Line

This alternative would maintain recruiting resources at today's levels. It would not allow the added spending needed to meet the goals of the Army's program. Enlistment bonuses, education assistance, and all the other expenses of recruiting would increase just enough to match future inflationary changes. All military personnel would continue to receive an annual pay raise keeping pace with increases in civilian wages.

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6. The Army arrived at a baseline of $34.6 billion by averaging two series of calculations. The first summed all military personnel appropriations for pays and benefits ($14.5 billion), retirement ($4 billion), the enlisted share of family housing ($1.4 billion), and the entire operation and maintenance budget ($20.2 billion), except for the portion estimated to be related to officers ($2.8 billion), for a grand total of $37.3 billion. The second differed by excluding all civilian personnel costs from the O&M budget (leaving an adjusted $11.9 billion from the original $20.2 billion), for a grand total of $31.8 billion.

TABLE 13. PROJECTIONS OF LONG-RUN PRODUCTIVITY AND COSTS IN THREE CASES UNDER VARYING HIGH SCHOOL GRADUATE PERCENTAGES a/

Cases	Percent of Recruits Who Are High School Graduates							
	69	73	76	80	83	87	90	94
Productivity								
Base Case b/								
Productivity Index	623.2	624.9	626.7	628.4	630.1	631.8	633.4	635.0
Percent Increase		0.28	0.28	0.28	0.27	0.26	0.26	0.25
High Case c/								
Productivity Index	613.5	616.4	619.3	622.2	625.0	627.8	630.5	633.1
Percent Increase		0.47	0.47	0.46	0.45	0.44	0.43	0.42
Low Case d/								
Productivity Index	602.9	603.7	604.3	604.8	605.4	605.9	606.4	606.9
Percent Increase		0.13	0.09	0.09	0.09	0.09	0.08	0.08
Manpower-Related Costs (In millions of 1987 dollars)								
Base Case e/								
Variable Cost	22,410	22,405	22,480	22,560	22,675	22,780	22,885	23,000
Percent Change		-.02	0.33	0.36	0.50	0.46	0.48	0.52

(Continued)

TABLE 13. (Continued)

Cases	Percent of Recruits Who Are High School Graduates							
	69	73	76	80	83	87	90	94
Manpower-Related Costs (In millions of 1987 dollars)								
High Case f/								
Variable Cost	23,380	22,370	22,465	22,565	22,705	22,840	22,885	23,005
Percent Change		-0.03	0.41	0.46	0.61	0.58	0.61	0.67
Low Case g/								
Variable Cost	22,440	22,435	22,490	22,560	22,735	22,790	22,815	22,910
Percent Change		-0.03	0.27	0.29	0.40	0.41	0.37	0.40

SOURCE: Congressional Budget Office.

a. All cases assume that 10 percent of recruits are in AFQT category IV and 65 percent in categories I to IIIA.
b. Assumes that both AFQT scores and high school graduation are predictive of first-term performance; that graduates outperform nongraduates during the first term; that first-term AFQT effects persist in the career force; and that enlisted performance increases substantially with experience. Compared with all other possible assumptions, these yield roughly the average response on the productivity index.
c. Assumes substantial increases in enlisted productivity with experience; that graduates always outperform nongraduates during the first-term, regardless of AFQT; and that first-term AFQT effects persist in the career force.
d. Assumes modest increases in enlisted productivity with experience; that high school graduation has no effect on first-term performance; and that AFQT has no effect on career performance.
e. In calculating enlistment bonuses, this assumption defines earnings as the discounted value of basic pay over the first three years of service. See box on page 15.
f. Defines earnings as the discounted value of regular military compensation over the first three years of service.
g. Defines earnings as the discounted value of regular military compensation over one year of service.

TABLE 14. PROJECTIONS OF LONG-RUN PRODUCTIVITY AND COSTS FOR VARYING PROPORTIONS OF AFQT I-IIIA RECRUITS AND HIGH SCHOOL GRADUATES, UNDER BASE-CASE ASSUMPTIONS

Productivity and Costs	Percent of Recruits Who Are High School Graduates							
	69	73	76	80	83	87	90	94
	Productivity Index							
Percent in I-IIIA:								
69	624.7	626.5	628.2	629.9	631.6	633.3	634.9	636.5
65	623.2	624.9	626.7	628.4	630.1	631.8	633.4	635.0
61.5	621.9	623.6	625.4	627.1	628.8	630.5	632.1	633.7
Percent Change in Productivity from:								
65 to 69 percent I-IIIA	0.25	0.24	0.24	0.24	0.24	0.24	0.23	0.23
65 to 61.5 percent I-IIIA	-0.21	-0.21	-0.21	0.21	-0.21	-0.21	-0.20	-0.20
	Manpower-Related Costs (In millions of 1987 dollars)							
Percent in I-IIIA:								
69	22,395	22,435	22,530	22,650	22,755	22,875	23,000	23,125
65	22,410	22,405	22,480	22,560	22,675	22,780	22,885	23,000
61.5	22,365	22,420	22,485	22,555	22,630	22,730	22,830	22,930
Percent Change in Costs from:								
65 to 69 percent I-IIIA	-0.07	0.13	0.23	0.40	0.37	0.43	0.49	0.53
65 to 61.5 percent I-IIIA	-0.20	0.02	0.02	-0.03	-0.19	-0.21	-0.26	-0.33

SOURCE: Congressional Budget Office.

NOTE: The base case assumes that both AFQT scores and high school graduation are predictive of first-term performance; that AFQT IIIB graduates outperform AFQT I-IIIA nongraduates during the first term; that first-term AFQT effects persist in the career force; and that enlisted performance increases substantially with experience (for example, the average soldier with 20 years' experience is assumed to be 2.5 times more productive than the average first-term soldier).

Effects on the Force. Holding the line would yield the baseline enlisted force that was highlighted in Chapter II. Although the supply of high-quality recruits would decline by about 18 percent over the next five years, quality would stay comparatively high. By 1991, about 81 percent of male recruits would be high school graduates. (The percentage of graduates would be greater if the Army eased the 10 percent limit on recruits in AFQT category IV.) And about 62 percent of all recruits would be in the top three AFQT categories I-IIIA.

These results would have little effect on the Army's career force over the next five years. From about 303,000 soldiers in 1985, it would peak at 305,000 in 1988 and then decline to 300,000 in 1991. But the proportion of career soldiers in AFQT categories I-IIIA would steadily grow, from today's figure of 44 percent to more than 52 percent five years hence. Under these conditions, the five-year cost of manning the Army would amount to roughly $96.6 billion (in current dollars). In the longer run, holding the line would lead to a career force of 281,600 soldiers, of whom 62 percent would be in the upper AFQT categories. Manning this long-run force would cost (in 1987 dollars) about $22.6 billion a year.

Pros and Cons. While avoiding substantial real increases in costs over the Army's program--$410 million to $785 million over the next five years--this alternative would supply the Army with a relatively high degree of quality. There would be more high school graduates, and higher test scores among recruits, than among youths as a whole. The outcome would also compare favorably with historical averages. Since 1974, for instance, the proportion of male high school graduates has averaged about 68 percent. Before that, during the years of conscription in 1964 through 1972, the average was also around 68 percent.

In the long run, under the "hold the line" alternative, the career force would be somewhat smaller than under the Army's program, and proportionately fewer soldiers would be in the upper AFQT categories. Holding the line would thus lessen the enlisted force's overall capability, though perhaps not dramatically. CBO's productivity index suggests there would be a decline (relative to the 65 percent AFQT I-IIIA version of the Army's program) of between 0.30 percent and 1.40 percent. Yet the long-run cost of manning the Army would be about 1.5 percent lower.

Holding the line would lessen the Army's hedge against adverse trends in recruitment or retention. If economic developments that are unfavorable to military recruiting were to materialize (such as lower unemployment or a

TABLE 15. EFFECTS OF ALTERNATIVE PROGRAMS FOR ARMY RECRUITING ON COSTS AND PERSONNEL: SUMMARY PROJECTION a/

	Army Program AFQT I-IIIA		Hold-the-Line Program	One-Year Cut in Resources	Three-Year Cut in Resources
	69 Percent	65 Percent			
Five-Year Costs (1987-1991) b/	97,370	96,995	96,585	96,160	95,780
Career Force in 1991					
Number (in thousands)	299.7	299.8	300.0	299.8	299.8
Percent AFQT I-IIIA	53.1	52.7	52.5	52.5	52.5
NPS Accessions in 1991 c/					
Number (in thousands)	127.1	127.0	128.4	130.3	131.9
Percent male HSDG d/	88.5	88.5	81.0	74.0	68.0
Percent AFQT I-IIIA	69.0	65.0	62.1	65.6	65.7
Annual Long-Run Costs e/	23,000	22,885	22,550	22,385	22,205
Long-Run Career Force					
Number (in thousands)	283.5	284.6	281.6	280.0	278.0

(Continued)

TABLE 15. (Continued)

	Army Program AFQT I-IIIA		Hold-the-Line Program	One-Year Cut in Resources	Three-Year Cut in Resources
	69 Percent	65 Percent			
Percent AFQT I-IIIA	66.6	63.2	61.7	62.1	61.0
Long-Run NPS Accessions c/					
Number (in thousands)	131.9	131.5	135.9	137.7	140.0
Percent male HSDG d/	88.5	88.5	79.0	75.0	69.5
Percent AFQT I-IIIA	69.0	65.0	65.0	65.7	62.9

SOURCE: Congressional Budget Office.

a. All programs assume that the proportion of AFQT IV recruits (all of whom are high school graduates) is held at 10 percent.

b. In millions of current dollars (adjusted for inflation).

c. Signifies recruits who are non-prior-service--without previous military experience. A detailed distribution of accessions appears in Appendix C.

d. High school diploma graduates.

e. In millions of 1987 dollars.

strong cohort effect on youths' civilian wages), history warns that the number of high-quality recruits could turn down very fast.

Alternative II: One-Year Reduction In Resources

A substantial, one-time cut in the Army's resources for recruiting could be made by suspending the enlistment bonus program in 1987. High-quality recruits who would otherwise qualify for bonuses could still receive supplemental education benefits, thus preserving some inducement for them to enlist. In addition, junior soldiers--those in the first two pay grades E-1 and E-2--would not receive the 4 percent October 1986 military pay raise contained in the President's budget. Such an action has precedent, in that enlisted personnel with less than four months' service did not receive a pay raise in 1984.

Effects on the Force. CBO projects that a one-time cut in bonuses and pay (if not restored in later years) would lessen the next five years' supply of high-quality recruits by about 23 percent. The proportion of male high school graduates would gradually decline from 88 percent in 1987 to about 74 percent by 1991. The proportion of AFQT I-IIIA recruits would stay high, at around 66 percent, but many would be nongraduates.

In five years' time, the career force would look substantially the same as under the first alternative--but five-year costs would be $425 million less, for a total of $96.2 billion. In the longer run, the lower proportion of high school graduates would mean higher attrition, and hence a slightly smaller career force of 280,000 soldiers.

Pros and Cons. Compared with the Army's program, a one-time cut in pay and bonuses would reduce the five-year costs of manning the Army by $835 million to $1.2 billion. 7/ Quality would also be lower than under the Army's program, though it would stay comparatively high in the near term. The proportion of high school graduates would stay above 80 percent through 1989, only then dropping into the seventies--decent by historical standards, but somewhat lower than the proportion in the male youth population. Recruits would, though, still have generally high AFQT scores. Almost two-thirds would score above the 50th percentile on the AFQT; and only 10 percent would be in category IV (versus 25 percent for the eligible population).

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7. These figures include only the Army's budget. Freezing the pay of junior personnel would affect the other military services as well, thus yielding actual savings in excess of those shown here.

This alternative would probably lessen the Army's overall capability more than Alternative I, though still not dramatically. CBO's productivity index suggests a long-run decrease (relative to the Army's 65 percent program) of about 1.1 percent. This compares with a projected decrease of about 2.2 percent in the long-run cost of manning the Army.

A one-year cut in resources would further erode the Army's safety margin. The risks attached to unexpected economic trends would thus be much higher. Moreover, any projection of the effects of cuts in pay or bonuses on the willingness of youths to enlist must be in some degree uncertain. Any proposal to cut military pay carries with it some risk of doing more damage than is anticipated here.

Alternative III: Three-Year Reduction in Resources

Building on the previous alternative, Alternative III would further reduce recruits' pay and benefits. In addition to suspending enlistment bonuses and freezing the pay of junior personnel in 1987, it would limit their pay raises in 1988 and 1989 to 3 percent; raises of roughly 6 percent a year would be required to keep pace with civilian wage increases. Comparable pay raises for junior personnel--without "catch-ups"--would resume in 1990.

Effects on the Force. Several years of reductions would increasingly erode the willingness of high-quality youths to enlist. CBO projects that between 1985 and 1991 the supply of high-quality recruits would decline by roughly 28 percent, or 10 percentage points more than under the first alternative. Such erosion would bring the Army near the statutory minimum for quality, with only 68 percent of male recruits holding high school diplomas by 1991. The Army might find it necessary to recruit male nongraduates who score below average in AFQT category IIIB.

Like the other alternatives, this one would have little effect on the career force in the near term. But in the longer run it might give the Army only 278,000 career personnel--2,000 fewer than under the previous alternative, and up to 6,600 fewer than under the Army's program.

Pros and Cons. Relative to the Army's program, cutting back resources for three years would save a total of $1.2 billion or $1.6 billion over the next five years. Though quality would decline, Alternative III would still leave the Army better off than it was in 1979 or 1980. Moreover, the Army could partially counter the effects of cutting pay and bonuses through other changes in policy--for instance, by lifting the 10 percent restriction on

recruits in AFQT category IV, or by recruiting more men and women who have prior military service.

Nevertheless, several years' reductions in recruit pay would go far to negate the Army's recent gains in capability. In the near term, the substantial drop in recruit quality would leave the Army little cushion against unexpected adverse trends in recruiting. In the longer term, the enlisted force's capability would lessen significantly. Compared with the Army's program (65 percent AFQT I-IIIA), Alternative III would result in a decrease in overall productivity of about 1.7 percent. Long-run costs would fall by about 3 percent.

APPENDIX A

CALCULATING PRODUCTIVITY AND COST

This appendix describes how CBO calculated the productivities and costs of alternative recruiting policies. The central element is an index of military productivity. Since not all soldiers contribute equally to the Army's capability, the productivity index converts a projected distribution of enlisted personnel to a rough measure of overall military effectiveness.

PROJECTING ENLISTED PERSONNEL

The index of productivity works from a long-run projection of the Army's enlisted force (roughly 30 years hence). To get there, CBO first classified the present inventory of enlisted personnel by education (high school graduate or dropout), by test-score category on the Armed Forces Qualification Test (categories I-IIIA, category IIIB, or category IV), and by years of military service (1 through 30); the resulting distribution appears in Table A-1. CBO's enlisted transition model--a basic Markov-chain model--uses matrices of "transition probabilities" to simulate the retention or separation decisions of enlisted personnel in each class.

A transition probability is the likelihood that a particular service member, in year of service (YOS) i at the start of a fiscal year, with j months until expiration of term of service (ETS), will be in YOS i+1 at the end. The transition probability for someone making a reenlistment decision during the projection period (less than 13 months to ETS) represents the reenlistment rate. The model extrapolates transition probabilities from historical rates provided by the Defense Manpower Data Center.

Of all the transition probabilities, only reenlistment rates are assumed to depend on future changes in civilian unemployment and relative military pay. Elasticities are used to express the percentage changes in reenlistment rates that may be expected from a 1 percent change in either of those two variables. They decline (become more inelastic) as years of service increase. With respect to changes in unemployment, CBO uses elasticities that range from 0.50 at the first reenlistment point to less than 0.10 after YOS 11. For changes in relative pay, the elasticities range from 2.5 in early

TABLE A-1. DISTRIBUTION OF ARMY ENLISTED PERSONNEL AT THE END OF FISCAL YEAR 1985 BY EDUCATION, AFQT CATEGORY, AND YEARS OF MILITARY SERVICE a/

Years of Service	AFQT Category I-IIIA	IIIB	IV	Unknown
		High School Graduates		
1	56,350	31,929	10,162	4
2 to 4	124,429	64,610	30,781	12
5 to 8	26,467	17,110	35,058	176
9 to 12	19,903	11,451	10,961	322
13 to 16	9,894	4,779	3,867	70
17 or more	119	42	36	5
Total	237,162	129,921	90,865	589
		Nongraduates		
1	8,481	612	10	4
2 to 4	16,956	2,812	90	1
5 to 8	5,674	6,371	8,701	37
9 to 12	5,499	5,817	3,986	76
13 to 16	3,171	2,643	1,807	29
17 or more	49	18	33	9
Total	39,830	18,273	14,627	156

(Continued)

a AFQT categories are expressed under the Defense Department's old population reference for all except the first year of service.

TABLE A-1. (Continued)

Years of Service	AFQT Category I-IIIA	IIIB	IV	Unknown
		Education Unknown b/		
1	851	339	46	159
2 to 4	8,589	5,484	177	378
5 to 8	14,112	7,370	3,446	1,954
9 to 12	10,765	5,226	3,049	2,251
13 to 16	12,974	4,806	2,101	2,814
17 or more	20,811	9,998	9,577	7,337
Total	68,102	33,223	18,396	14,893
		All		
1	65,682	32,880	10,218	167
2 to 4	149,974	72,906	31,048	391
5 to 8	46,253	30,851	47,205	2,167
9 to 12	36,167	22,494	17,996	2,649
13 to 16	26,039	12,228	7,775	2,913
17 or more	20,979	10,058	9,646	7,351
Total	345,094	181,417	123,888	15,638

SOURCE: Unofficial tabulations provided by the Defense Manpower Data Center.

b. Data on soldiers' education go only as far back as 1970, hence the large number of soldiers with more than 15 years' service whose educational background is unknown. Of those educational unknowns with fewer than 15 years' service, the majority probably enlisted as prior-service recruits.

TABLE A-2. ESTIMATED RETENTION ELASTICITIES FOR CHANGES IN RELATIVE MILITARY PAY AND CIVILIAN UNEMPLOYMENT, BY YEARS OF SERVICE

Years of Service a/	Retention Elasticities for Changes In:	
	Pay	Unemployment
2	2.8	0.60
3	2.4	0.50
4	2.2	0.45
5	1.8	0.35
6	1.7	0.30
7	1.6	0.30
8	1.3	0.20
9	1.1	0.20
10	1.0	0.15
11	0.9	0.15
12	0.8	0.10
13	0.7	0.10
14	0.5	0.05
15	0.5	0.05
20	2.5	0.35
21	2.4	0.30

a. Retention in years of service 16-19 and 22-30 is assumed not to change with respect to modest year-to-year changes in economic variables.

years of service to less than 1.0 after YOS 11. (See Table A-2.) CBO estimated these elasticities from logistic regression equations that relate past changes in unemployment and pay to the Army's historical reenlistment rates.

The effects of changes in pay are expressed through the Annualized Cost of Leaving model (ACOL). This model links the reenlistment decision to a comparison between the cost of leaving service now and the cost of leaving at some later date. Real increases in military pay boost the cost of leaving now, thus raising reenlistment rates. 1/

1. For a brief overview of the ACOL model, see Congressional Budget Office, *Elimination of Double Tax Benefits for Military Homeowners* (March 1986), Appendix C.

CALCULATING THE INDEX

CBO simplified the long-run projection by collapsing the force into 18 groups based on aptitude, education, and experience (as shown in Table 12). The index is based on each group's "productivity equivalence": the total number of soldiers belonging to that group multiplied by the relative productivity of the typical soldier in that group. The sum of these figures provides a rough measure of the Army's overall capability under different recruiting policies.

The index is meant to be suggestive rather than predictive. By adding group productivities together, it oversimplifies the relationships between quality and performance (as discussed in greater detail below). Moreover, the index involves the stringent assumption that nonlabor inputs (new weapons, capital intensity, technical progress) will be constant, or else will have no influence on the relative productivities of different classes of soldiers. 2/ The Army's analysis of tank crews, for one, calls this assumption into question insofar as a new nonlabor input (the M-1 tank) has improved the relative productivity of AFQT category IV crewmen.

The Additivity Assumption

The additivity assumption deserves emphasis, because it makes different types of personnel perfect substitutes for one another. 3/ To illustrate, consider a hypothetical case in which one sergeant is deemed to be worth three newly trained recruits. No matter how many sergeants the Army has, the additivity assumption lets three recruits substitute for one sergeant without sacrificing productivity. 4/ Even if the Army lost 90 percent of its sergeants, three newly-trained recruits would still make up for the supervision and guidance lost with each departing sergeant. Clearly, this extreme case strains the additivity assumption. But since CBO foresaw no such dramatic shift in the enlisted personnel force, assuming a more sophisticated relationship than additivity would probably make minor difference. 5/

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2. Mark Albrecht, *Labor Substitution in the Military Environment: Implications for Enlisted Force Management* (Santa Monica: The Rand Corporation, November 1979), p. 9.

3. That is, the elasticity of substitution between any two groups is assumed to be infinite.

4. See Center for Naval Analyses, Institute of Naval Studies, *Navy Manpower Considerations 1970-1980* (February 1966), Appendixes to Annex G.

5. Moreover, some empirical research suggests that elasticities of substitution between different classes of labor can be as high as 10.

Assumptions about Relative Productivity

Choosing relative productivities to use in the index involves educated guesswork, because the empirical evidence is not definitive. Soldiers in AFQT categories I-IIIA seem to perform 10 percent to 20 percent better during the first term of service, and productivity probably rises with seniority. But no one knows for certain the connection between high school graduation and performance in the first-term force, nor the connection between ability and experience in the career force.

Because of this uncertainty, CBO calculated the index of productivity under 18 alternative sets of assumptions. All combine differing judgments about the effects on performance of high school graduation and experience, and express the productivity of the average member for a particular class of personnel, relative to the productivity of a fully-trained AFQT I-IIIA soldier who has five to eight years of military service.

The calculations all share two elements. First, the average first-term soldier is assumed to be only about three-quarters as productive as a fully-trained soldier with five to eight years of military service. CBO based this on findings from the Rand Corporation's Enlisted Utilization Survey (EUS). Second, CBO assumed that the effects of high school graduation on soldiers' individual productivity, if any, do not persist past the first term.

On the effects of AFQT, CBO tested three alternative assumptions. The first corresponds to the position of the Office of the Assistant Secretary of Defense (for Force Manpower and Personnel) that AFQT is not a meaningful measure of quality in the career force. Thus, only years of service affect the relative productivities of different soldiers in the career force. The second assumption reflects econometric findings that, among those having the same educational background, high-aptitude people realize significantly higher earnings throughout their working careers. Thus, AFQT I-IIIA soldiers are 4 percent to 8 percent more productive at all years of service. The third assumption, which mirrors the Army's position, holds that AFQT has equal effects on first-term and career performance.

Because the empirical evidence on high school education is mixed, CBO tested several possibilities. First, that education has no bearing on first-term performance; whether graduates or dropouts, AFQT I-IIIA recruits outperform AFQT IIIB recruits by about 10 percent, and AFQT IV recruits by about 20 percent. Second, that the average AFQT I-IIIA nongraduate is only as productive as the average AFQT IIIB graduate (part of the base case). And third, reflecting the findings of Rand's EUS, that the average high school graduate always outperforms the average nongraduate, regardless of AFQT.

TABLE A-3. RELATIVE PRODUCTIVITIES OF FIRST-TERM ENLISTED SOLDIERS UNDER ALTERNATIVE ASSUMPTIONS a/

Education	AFQT Categories I-IIIA	IIIB	IV
Base Case			
Graduate	0.77	0.70	0.63
Nongraduate	0.70	0.63	b/
Alternative 1 c/			
Graduate	0.77	0.70	0.63
Nongraduate	0.77	0.70	b/
Alternative 2 d/			
Graduate	0.77	0.70	0.63
Nongraduate	0.60	0.54	b/

a. Productivity is expressed relative to a fully-trained AFQT I-IIIA soldier with between five and eight years of military service.
b. The Army does not enlist non-high school graduates who place in the lowest acceptable AFQT category.
c. Assumes that education has no effect on first-term performance.
d. Assumes that education plays a dominant role during the first term.

Finally, CBO tested two assumptions about the effects of experience. The first holds that the productivity profile of soldiers is like that of civilian workers, as revealed by increases in civilian wages with age. 6/ Converting civilian wage increases by age to military years of service suggests that soldiers with nine to twelve years' experience are about 28 percent more productive than those with five to eight years' experience, and so on. Since earnings may be an imperfect proxy for actual performance, the second assumption arbitrarily lets performance increase only half as fast as earnings over time. Tables A-3 and A-4 summarize these assumptions.

6. From David Jacquette and Gary Nelson, *The Implications of Manpower Supply and Productivity for the Pay and Composition of the Military Force: An Optimization Model* (Santa Monica, Calif.: The Rand Corporation, July 1974) p. 22. The authors borrowed from estimates provided by Gary Becker, *Human Capital* (New York: National Bureau of Economic Research, 1964).

TABLE A-4. RELATIVE PRODUCTIVITIES OF CAREER ENLISTED SOLDIERS UNDER ALTERNATIVE ASSUMPTIONS a/

Years of Service	AFQT Categories					
	I-IIIA	IIIB	IV	I-IIIA	IIIB	IV
	Substantial Returns to Experience b/			Modest Returns to Experience b/		
Alternative 1 c/						
5 to 8	1.00	0.91	0.82	1.00	0.91	0.82
9 to 12	1.28	1.16	1.05	1.14	1.04	0.93
13 to 16	1.51	1.37	1.24	1.24	1.13	1.02
17 to 30	1.75	1.59	1.43	1.34	1.22	1.10
Alternative 2 d/						
5 to 8	1.00	0.96	0.92	1.00	0.96	0.92
9 to 12	1.28	1.23	1.18	1.14	1.09	1.05
13 to 16	1.51	1.45	1.39	1.24	1.19	1.14
17 to 30	1.75	1.68	1.61	1.34	1.29	1.23
Alternative 3 e/						
5 to 8	1.00	1.00	1.00	1.00	1.00	1.00
9 to 12	1.28	1.28	1.28	1.14	1.14	1.14
13 to 16	1.51	1.51	1.51	1.24	1.24	1.24
17 to 30	1.75	1.75	1.75	1.34	1.34	1.34

a. See Table A-3.
b. Based on civilian wage increases by age.
c. Assumes that first-term effects persist into the career force.
d. Based on econometrically-derived relationship between ability and civilian earnings.
e. Assumes AFQT has no effect on career soldiers' performance.

ESTIMATING THE COSTS

Increases in starting pay dominate CBO's estimate of the costs of obtaining higher recruit quality. CBO assumed that enlistment bonuses would be employed to increase starting pay because they are an efficient means of attracting recruits. Only a narrow group would receive additional compensation, in this case AFQT I-IIIA high school graduates who serve in qualifying skills. Since they are large sums "up-front," enlistment bonuses offer especial appeal to young people who may prefer money now to money later. Studies find that youths have considerable time preferences for money, amounting to high discount rates of around 15 to 20 percent for money now. 7/ Since they have a higher regard for present benefits than for future payments of equal size, they are willing to trade the latter for smaller sums in the present.

In calculating the need for new recruiting resources, CBO also took note of the trade-offs made by Army recruiters in the investment of their time. Recruiters must balance the time spent seeking out high-quality candidates for service against the time spent screening, advising, and selecting youths of lower quality. If the Army's overall need for lower-quality recruits declined--as it would under the Army's program--recruiters would reallocate their time to producing more high-quality recruits without additional recruiting resources. Based on innovative work by the Rand Corporation, CBO assumed a trade-off elasticity of high-quality for lower-quality enlistments of -0.30. 8/

The rest of this section describes the other variable costs that are sensitive to changes in recruitment.

Recruiting and Turnover Costs

In the category of recruiting costs, CBO includes the costs of examining and processing recruits, of supporting the recruiting command, and of education assistance programs. (The direct costs of military personnel associated with these activities fall under "Pay and Benefits" and "Retirement".) High-quality youths are comparatively expensive to recruit, because they get a

7. R. Yilmaz Arguden, *Personnel Management in the Military: Effects of Retirement Policies on the Retention of Personnel* (Santa Monica, Calif.: The Rand Corporation, January 1986), p.60.

8. See James Dertouzous, *Recruiter Incentives and Enlistment Supply* (Santa Monica, Calif.: The Rand Corporation, May 1985), p. 29.

disproportionate share of the Army's education assistance, and also account for more than their share of the recruiting command's costs. Since high-quality youths are about four times more difficult to recruit into the Army than youths of lower quality, CBO assumed that the typical lower-quality youth costs only one-fourth as much to recruit. 9/ To increase the flow of high-quality recruits, many of the Army's nonpersonnel expenses would have to increase. Thus, a program that raised the need for AFQT I-IIIA high school graduates--even if it reduced the overall need for recruits--could raise the overall cost of recruiting.

For education assistance, CBO calculated only the Defense Department's share of the accrual charge, the amount that would have to be set aside today to pay for future supplemental benefits under the new GI Bill. The charge averages out to roughly $1,140 per high-quality recruit (in 1987 dollars).

In the category of turnover-related costs, about one-half consists of the variable expenses of training recruits: these include civilian salaries, ammunition, and maintenance of installations, but not the salaries of military trainers. CBO estimates that these costs average about $1,600 a recruit. The other half includes the expenses of paying for soldiers' travel between home and base when they enter or leave service (about $900 a trip), and any costs of unemployment compensation.

9. *Ibid.*, p. 19.

APPENDIX B

OCCUPATIONAL DESCRIPTIONS

Brief descriptions of various Army occupations mentioned in this study:

LANCE Missile Crewmember

Positions, emplaces, assembles, and prepares LANCE missiles for firing.

HAWK Missile Crewmember

Maintains and prepares HAWK missiles and associated equipment for launching missions.

HAWK Firing Section Mechanic

Maintains improved HAWK high-powered illuminator radar. Maintains mechanical, hydraulic, and electrical systems of the launcher, loader-transporter, and associated equipment.

HAWK Missile Fire Control Crewmember

Operates fire control equipment in command and acquisition or firing section of HAWK firing platoon. Operates engagement simulator in headquarters battery of HAWK missile battalion.

Administrative Specialist

Performs typing, clerical, and administrative duties.

Cavalry Scout

Assists in performance of armored reconnaissance.

Infantryman

Employs individual weapons and machine guns in combat operations. Closes with and destroys enemy personnel, weapons, and equipment.

Radio Teletype Operator

Operates radio teletype equipment to transmit and receive messages. Prepares messages in proper format for delivery.

Light Wheel Vehicle and Power Generation Mechanic

Troubleshoots and performs maintenance on internal combustion engines and accessories, powertrain, and chassis components of light wheel vehicles. Also maintains tactical, utility, and precise power generation equipment and associated equipment such as electric arc welders.

Unit Supply Specialist

Receives, stores, issues, accounts for, and preserves supplies in the unit.

Multichannel Communications Equipment Operator

Installs and operates radios, communications security devices, and multiplexer equipment.

Medical Specialist

Performs or assists with preventive, therapeutic, and emergency nursing care procedures under supervision of physician or nurse.

APPENDIX C

DETAILED PROJECTIONS

Detailed projections of recruitment and retention and costs under alternative recruiting policies.

TABLE C-1. PROJECTIONS OF CAREER PERSONNEL BY AFQT CATEGORY UNDER VARIOUS RECRUITING STRATEGIES (By fiscal year, in thousands)

AFQT	1987	1988	1989	1990	1991	Long-Run a/
Baseline						
I-IIIA	144.6	150.0	153.4	156.3	157.4	173.8
IIIB	83.5	84.2	82.9	83.0	83.4	77.0
IV	77.0	71.1	65.7	62.1	59.2	30.8
Total	305.1	305.3	302.0	301.4	300.0	281.6
Army Program (65 Percent I-IIIA)						
I-IIIA	144.6	150.0	153.4	155.8	157.9	179.8
IIIB	83.5	84.2	82.9	83.7	82.8	74.3
IV	77.0	71.1	65.7	62.1	59.1	30.1
Total	305.1	305.3	302.0	301.6	299.8	284.6
Army Program (69 Percent I-IIIA)						
I-IIIA	144.6	150.0	153.4	155.8	159.0	188.8
IIIB	83.5	84.2	82.9	83.7	81.4	63.3
IV	77.0	71.1	65.7	62.1	59.3	31.4
Total	305.1	305.3	302.0	301.6	299.7	283.5
One-Year Cut in Resources b/						
I-IIIA	144.6	150.0	153.4	156.3	157.3	173.9
IIIB	83.5	84.2	82.9	83.0	83.4	74.9
IV	77.0	71.1	65.7	62.1	59.1	31.2
Total	305.1	305.3	302.0	301.4	299.8	280.0
Three-Year Cut in Resources c/						
I-IIIA	144.6	150.0	153.4	156.3	157.3	169.6
IIIB	83.5	84.2	82.9	83.0	83.4	76.8
IV	77.0	71.1	65.7	62.1	59.1	31.7
Total	305.1	305.3	302.0	301.4	299.8	278.1

a. Projection year 2013.
b. Suspend enlistment bonuses and junior enlisted pay raise in 1987.
c. Same as b in 1987. Limit junior enlisted pay raises to 3 percent in 1988 and 1989.

TABLE C-2. PROJECTED DISTRIBUTION OF NON-PRIOR-SERVICE MALE ACCESSIONS BY EDUCATION UNDER DIFFERENT RECRUITING STRATEGIES (By fiscal year, in thousands) a/

Education and AFQT	1987	1988	1989	1990	1991
Baseline					
HSDG I-IIIA	55.7	54.9	50.3	49.1	47.3
HSDG IIIB	30.0	30.3	30.5	30.7	31.2
HSDG IV	12.4	12.5	12.6	12.7	12.8
Non-HSDG I-IIIA	9.6	12.0	17.1	18.6	21.5
Army Program (65 Percent I-IIIA)					
HSDG I-IIIA	57.6	58.1	58.5	58.2	58.9
HSDG IIIB	25.3	26.7	26.8	26.7	27.0
HSDG IV	12.4	12.5	12.6	12.6	12.7
Non-HSDG I-IIIA	12.4	12.5	12.6	12.5	12.7
Army Program (69 Percent I-IIIA)					
HSDG I-IIIA	62.5	63.0	63.7	63.0	64.1
HSDG IIIB	20.3	21.6	21.9	21.6	22.0
HSDG IV	12.3	12.5	12.6	12.5	12.7
Non-HSDG I-IIIA	12.3	12.5	12.6	12.5	12.7
One-Year Cut in Resources b/					
HSDG I-IIIA	53.0	48.4	47.3	46.1	44.4
HSDG IIIB	30.0	30.4	30.8	28.7	27.1
HSDG IV	12.4	12.6	12.7	12.8	13.0
Non-HSDG I-IIIA	12.5	19.3	20.7	24.6	30.1
Three-Year Cut in Resources c/					
HSDG I-IIIA	53.0	46.9	44.1	43.0	41.5
HSDG IIIB	30.0	30.4	28.3	25.3	24.8
HSDG IV	12.4	12.6	12.8	12.9	13.2
Non-HSDG I-IIIA	12.5	20.9	27.0	32.3	34.3
Non-HSDG IIIB	0.0	0.0	0.0	0.0	2.5

NOTE: HSDG signifies high school diploma graduate.

a. Assumes 10,300 female, NPS, HSDG I-IIIA accessions in 1987; 10,900 such accessions in later years. Also, 5,600 female HSDG IIIB accessions in 1987, 4,700 in later years.

b. Suspend enlistment bonuses and junior enlisted pay raise in 1987.

c. Same as b in 1987. Limit junior enlisted pay raises to 3 percent in 1988 and 1989.

TABLE C-3. PROJECTED VARIABLE COSTS OF MANNING THE ARMY UNDER ALTERNATIVE RECRUITING STRATEGIES, FISCAL YEARS 1987-1991 (In millions of current dollars) a/

Type of Cost	1987	1988	1989	1990	1991	Five-Year Total
One-Year Cut in Resources						
Recruiting b/	235	235	240	245	245	1,200
Turnover c/	625	665	690	720	760	3,460
Pay and Benefits d/	12,795	13,565	14,345	15,205	16,130	72,040
Retirement Accrual e/	3,380	3,585	3,805	4,035	4,290	19,095
Enlistment Bonuses	15 f/	60	95	95	100	365
Total	17,050	18,110	19,175	20,300	21,525	96,160
Three-Year Cut in Resources						
Recruiting b/	235	230	230	235	240	1,170
Turnover c/	625	665	695	725	765	3,475
Pay and Benefits d/	12,795	13,530	14,275	15,130	16,050	71,780
Retirement Accrual e/	3,380	3,580	3,780	4,010	4,255	19,005
Enlistment Bonuses	15 f/	55	90	95	95	350
Total	17,050	18,060	19,070	20,195	21,405	95,780

a. Estimates of inflation and wage increases originate from CBO's medium-term economic projections.

b. Includes costs of examining and processing recruits, supporting the U.S. Army Recruiting Command, and the accrual cost of maintaining the Army College Fund (supplemental education benefits with an estimated accrual value of about $1,140 per high-quality recruit).

c. Includes variable expenses of training recruits--civilian salaries, ammunition, maintenance, and installations--amounting to about $1,600 a recruit. (Source: U.S. Army, *TRADOC Resource Factor Handbook*, vol. 2, Resource Estimating Relationships). Also, the expense of soldiers' travel between home and military installation (accession and separation permanent change of station moves).

d. Includes pays and allowances in the Military Personnel Account (such as basic pay, quarters allowance, reenlistment bonuses), plus operation and maintenance costs of medical care (inpatient and outpatient), plus reimbursement for travel not included in c.

e. Calculated as a percentage of basic pay, with the overall factor dependent on the composition of the enlisted force. For 1985, CBO calculates an accrual charge particular to the Army of 41.1 percent--about 10 percentage points less than the charge for all of the Defense Department that is used in budget calculations.

f. Represents residual payments to enlistees from fiscal year 1986.

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